UNIVERSAL
LIBRARY

OU_158131

UNIVERSAL
LIBRARY

OSMANIA UNIVERSITY LIBRARY

547.2/E 31 P Accession No 26847

Egloff. G.

ysical Constants of Hyderocarbon

should be returned on or before the date last marked below.

PHYSICAL CONSTANTS OF HYDROCARBONS

Volume IV

POLYNUCLEAR AROMATIC HYDROCARBONS

GUSTAV EGLOFF
DIRECTOR OF RESEARCH
UNIVERSAL OIL PRODUCTS COMPANY
RESEARCH LABORATORIES
CHICAGO, ILLINOIS

American Chemical Society
Monograph Series

REINHOLD PUBLISHING CORPORATION
330 WEST FORTY-SECOND STREET, NEW YORK, U. S. A.
1947

Copyright 1947, By
REINHOLD PUBLISHING CORPORATION

All rights reserved

Dedicated to

JOSEPH G. ALTHER

GENERAL INTRODUCTION

American Chemical Society Series of Chemical Monographs

By arrangement with the Interallied Conference of Pure and Applied Chemistry, which met in London and Brussels in July, 1919, the American Chemical Society was to undertake the production and publication of Scientific and Technologic monographs on chemical subjects. At the same time it was agreed that the National Research Council, in cooperation with the American Chemical Society and the American Physical Society, should undertake the production and publication of Critical Tables of Chemical and Physical Constants. The American Chemical Society and the National Research Council mutually agreed to care for these two fields of chemical development. The American Chemical Society named as Trustees, to make the necessary arrangements for the publication of the monographs, Charles L. Parsons, secretary of the Society, Washington, D. C.; the late John E. Teeple, then treasurer of the Society, New York; and the late Professor Gellert Alleman of Swarthmore College. The Trustees arranged for the publication of the A.C.S. series of (a) Scientific and (b) Technologic Monographs by the Chemical Catalog Company, Inc. (Reinhold Publishing Corporation, successors) of New York.

The Council of the American Chemical Society, acting through its Committee on National Policy, appointed editors (the present list of whom appears at the close of this introduction) to select authors of competent authority in their respective fields and to consider critically the manuscripts submitted.

The first monograph of the series appeared in 1921. After twenty-three years of experience certain modifications of general policy are indicated. In the beginning there still remained from the preceding five decades a distinct though arbitrary differentiation between so-called "pure science" publications and technologic or applied science literature. This differentiation is fast becoming nebulous. Research in private enterprise has grown apace and not a little of it is pursued on the frontiers of knowledge. Furthermore, most workers in the sciences are coming to see the artificiality of the separation. The methods of both groups of workers are the same. They employ the same instrumentalities, and now frankly recognize that their objectives are common, namely the search for new knowledge for the service of man. The officers of the Society therefore have combined the two editorial Boards in a single Board of twelve representative members.

Also in the beginning of the series, it seemed expedient to construe rather broadly the definition of a monograph. Needs of workers had to be recognized. Consequently among the first one hundred monographs appeared works in the form of treatises covering in some instances rather broad areas. Because such necessary works do not now want for publishers, it is considered advisable to hew more strictly to the line of the monograph character which means more complete and critical treatment of relatively restricted areas, and where a broader field needs coverage, to subdivide it into logical sub-areas. The prodigious expansion of new knowledge makes such a change desirable.

These monographs are intended to serve two principal purposes: first, to make available to chemists a thorough treatment of a selected area in form usable by persons working in more or less unrelated fields to the end that they may correlate their own work with a larger area of physical science discipline; second, to stimulate further research in the specific field treated. To implement this purpose the authors of monographs are expected to give extended references to the literature. Where the literature is of such volume that a complete bibliography is impracticable, the authors are expected to append a list of references critically selected on the basis of their relative importance and significance.

AMERICAN CHEMICAL SOCIETY

BOARD OF EDITORS

F. W. Willard, *Editor of Monographs*

T. H. Chilton
W. M. Clark
L. F. Fieser
J. Bennett Hill
S. C. Lind
C. H. Mathewson
Linus C. Pauling
W. T. Read
Walter A. Schmidt
C. A. Thomas
E. R. Weidlein
W. G. Whitman

Preface

The principal source of polynuclear aromatic hydrocarbons is coal-tar. Some of these compounds are also found in petroleum and other natural sources, and many are produced synthetically. Commercial utilization of these hydrocarbons has been confined essentially to the dyestuff industry. Among the polynuclears are compounds of physiological interest such as the carcinogenic or cancer producing hydrocarbons.

Volume IV is a collation of all melting point, boiling point, density, and refractive index data available on polynuclear aromatic hydrocarbons. This survey shows that the opportunities for research on polynuclear aromatics are far from being exhausted. The thousands of known compounds represent only a small fraction of the theoretical possibilities. The physical data on the known compounds are so scanty that there is a great need for investigation of the physical constants of polynuclears.

We are indeed grateful to the staff of John Crerar Library for valuable guidance in the location of material and for privileges granted in connection with use of the outstanding facilities of this institution.

Deep appreciation is hereby expressed for the assistance of the Universal Oil Products Company and the author's colleagues, Mary Alexander, Nancy Corbin, M. S. Beyt, and Madge Spiegler, in this collation and critical study of the physical constants of aromatic hydrocarbons.

GUSTAV EGLOFF

Chicago, Ill.,
March 1, 1946

Contents

Volume IV

Page

General Introduction v

Preface vii

Introduction 1
- Foreword 1
- Nomenclature 2
- Order of Tabulating Compounds 13

I. Benzocyclanes C_nH_{2n-8} 19
1. Indane and Its Alkyl Derivatives 20
2. Tetrahydronaphthalene and Its Alkyl Derivatives 28
3. Higher Benzocyclanes 44

II. Polynuclear Aromatics of Empirical Formula C_nH_{2n-10} 45
1. Indene and Its Alkyl Derivatives 46
2. Indane with One Alkenyl or One Alkylidene Substitution 51
3. Dihydronaphthalene and Its Alkyl Derivatives 52
4. Tetrahydronaphthalene Derivatives of Empirical Formula C_nH_{2n-10} 58
5. Cyclopentanotetrahydronaphthalenes and Their Alkyl Derivatives 60
6. Octahydroanthracenes and Their Alkyl Derivatives 62
7. Octahydrophenanthrenes and Their Alkyl Derivatives 64
8. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-10} 68

III. Polynuclear Aromatics of Empirical Formula C_nH_{2n-12} 74
1. Indene with One Alkenyl or One Alkylidene Substitution 75
2. Naphthalene and Its Alkyl Derivatives 77
3. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-12} 116

IV. Polynuclear Aromatics of Empirical Formula C_nH_{2n-14} 125
1. Naphthalene Derivatives of Empirical Formula C_nH_{2n-14} 126
2. Cyclanonaphthalenes and Their Alkyl Derivatives 131
3. Tetrahydroanthracenes, Tetrahydrophenanthrenes, and Their Alkyl Derivatives 137
4. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-14} 140

V. Polynuclear Aromatics of Empirical Formula C_nH_{2n-16} 142
1. Indane with One Phenyl Substitution 143
2. Naphthalene Derivatives of Empirical Formula C_nH_{2n-16} 145
3. Tetrahydronaphthalene with One Phenyl Substitution 149
4. Biphenylene, Fluorene, and Their Alkyl Derivatives 151

Page
5. Dihydroanthracenes, Dihydrophenanthrenes, and Their Alkyl Derivatives 158
6. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-16} 166

VI. Polynuclear Aromatics of Empirical Formula C_nH_{2n-18} 175
1. Indene with One Phenyl Substitution 176
2. Anthracene and Its Alkyl Derivatives 180
3. Phenanthrene and Its Alkyl Derivatives 192
4. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-18} 210

VII. Polynuclear Aromatics of Empirical Formula C_nH_{2n-20} 223
1. Indene Derivatives of Empirical Formula C_nH_{2n-20} 224
2. Naphthalene Derivatives of Empirical Formula C_nH_{2n-20} 226
3. Cyclanoanthracenes and Their Alkyl Derivatives 231
4. Cyclanophenanthrenes and Their Alkyl Derivatives 233
5. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-20} 239

VIII. Polynuclear Aromatics of Empirical Formula C_nH_{2n-22} 248
1. Naphthalene with Phenylalkenyl Substitutions 249
2. Anthracene and Phenanthrene Derivatives of Empirical Formula C_nH_{2n-22} 251
3. Cyclenoanthracenes, Cyclenophenanthrenes and Their Alkyl Derivatives 253
4. Benzofluorenes and Their Alkyl Derivatives 256
5. Pyrene and Its Alkyl Derivatives 258
6. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-22} 260

IX. Polynuclear Aromatics of Empirical Formula C_nH_{2n-24} 269
1. Fluorene Derivatives of Empirical Formula C_nH_{2n-24} 270
2. Dihydroanthracenes and Dihydrophenanthrenes with One Phenyl Substitution 274
3. 1,2-Benzoanthracene and Its Alkyl Derivatives 277
4. 3,4-Benzophenanthrene and Its Alkyl Derivatives 288
5. Naphthacene and Its Alkyl Derivatives 290
6. Chrysene and Its Alkyl Derivatives 292
7. Triphenylene and Its Alkyl Derivatives 297
8. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-24} 299

X. Polynuclear Aromatics of Empirical Formula C_nH_{2n-26} 312
1. Indene with Two Phenyl Substitutions 313
2. Binaphthyls, Their Alkyl Derivatives, and Two Naphthyl Substitutions on Alkanes 317
3. Anthracene and Phenanthrene with One Phenyl Substitution 325
4. Cholanthrene and Its Alkyl Derivatives 333
5. Other Benzocyclanoanthracenes, Benzocyclanophenanthrenes, and Their Alkyl Derivatives 336
6. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-26} 340

XI. Polynuclear Aromatics of Empirical Formula C_nH_{2n-28} 349
1. Indene Derivatives of Empirical Formula C_nH_{2n-28} 350
2. Naphthalene with Two Phenyl or One Biphenyl Substitutions 353
3. Benzopyrenes and Their Alkyl Derivatives 358
4. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-28} 361

Page

XII. Polynuclear Aromatics of Empirical Formula C_nH_{2n-29} 370

XIII. Polynuclear Aromatics of Empirical Formula C_nH_{2n-30} 372
1. Picene and Its Alkyl Derivatives 373
2. Dibenzoanthracenes, Dibenzophenanthrenes, and Their Alkyl Derivatives 375
3. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-30} 379

XIV. Polynuclear Aromatics of Empirical Formula C_nH_{2n-32} 388
1. Indane with Three Phenyl Substitutions 389
2. Fluorene with Two Phenyl Substitutions 391
3. Dihydroanthracenes and Dihydrophenanthrenes with Two Phenyl Substitutions 393
4. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-32} 396

XV. Polynuclear Aromatics of Empirical Formula C_nH_{2n-34} 403
1. Indene with Three Phenyl Substitutions 404
2. Anthracene or Phenanthrene with Two Phenyl Substitutions 407
3. Miscellaneous Polynuclear Aromatics of Empirical Formula, C_nH_{2n-34} 415

XVI. Polynuclear Aromatics of Empirical Formula C_nH_{2n-36} 429

XVII. Polynuclear Aromatics of Empirical Formula C_nH_{2n-38} 445

XVIII. Polynuclear Aromatics of Empirical Formula C_nH_{2n-40} 457

XIX. Polynuclear Aromatics of Empirical Formula C_nH_{2n-42} 468

XX. Polynuclear Aromatics of Empirical Formula C_nH_{2n-44} 476

XXI. Polynuclear Aromatics of Empirical Formula C_nH_{2n-46} 482

XXII. Polynuclear Aromatics of Empirical Formula C_nH_{2n-48} 489

XXIII. Polynuclear Aromatics of Empirical Formula C_nH_{2n-50} 497

XXIV. Polynuclear Aromatics of Empirical Formula C_nH_{2n-52} 508

XXV. Polynuclear Aromatics of Empirical Formula C_nH_{2n-54} 511

XXVI. Polynuclear Aromatics of Empirical Formula C_nH_{2n-56} 518

XXVII. Polynuclear Aromatics of Empirical Formula C_nH_{2n-58} 524

XXVIII. Polynuclear Aromatics of Empirical Formula $C_nH_{2n-60 \text{ to } 88}$ 528

INTRODUCTION

Foreword

The fourth volume of Physical Constants of Hydrocarbons is a collation and evaluation of the physical constants of polynuclear aromatic hydrocarbons. The compounds included under this classification are fused ring hydrocarbons having at least one aromatic ring.

The study conducted for this volume is a continuation of that made for Volume III.[1] References through April, 1945 were added to those collected concurrently with material for the previous volume. Details concerning the extent of literature coverage are explained in the Introduction to Volume III.

Although thousands of polynuclear aromatic hydrocarbons have been prepared, these compounds represent only a minor fraction of the theoretical possibilities. A great number of the larger polynuclears have been synthesized in recent years particularly in connection with cancer research and other physiological problems.

The present study also shows that the published data for many of the known compounds are insufficient for the identification of these compounds on the basis of physical properties alone. Identification of the carcinogenic and other higher polynuclear hydrocarbons has been markedly facilitated by the study of their ultraviolet, infrared, and Raman spectra.

Critical evaluation of the data in Volume IV was limited by the paucity of data available from the literature. Fewer constants have been determined for the polynuclear aromatics than for the mononuclear aromatics and consequently, the tabulations in this volume are not made with the discrimination possible in Volume III. For example, in Volume IV, melting ranges of over 2° and boiling ranges greater than 5° have been recorded for many compounds because these figures were the only ones available. Likewise, refractive index and density values for which temperature conditions were not stated in the literature appear in Volume IV. Many of these values have apparently been determined on the compound in the solid state, but a notation of the state of aggregation is included in the tabulations only when verified by the reference.

The methods used in the calculation of the most probable values of constants are described in the Introduction of Volume III. The lack of data for the polynuclear aromatics makes it impossible to calculate "best values" for many of the compounds. Only melting point data are available on the greater portion of the polynuclears. Boiling point, density, and refractive index values have been determined for only a very few polynuclears and in most cases the number of values determined is too small to permit the calculation of constants of equations representing them.

[1] Egloff, G., "Physical Constants of Hydrocarbons," Volume III, Reinhold Publishing Corporation, New York, **1946**.

Nomenclature

Inasmuch as the nomenclature used for the polynuclear aromatic hydrocarbons in Volume IV does not rigidly follow any previously described system, it will be explained in the following discussion. "The Ring Index"[1] provides the only system sufficiently developed to permit the naming of the nuclei of all polynuclear hydrocarbons. Primarily an attempt is made to conform to these rules, but complications arising in the nomenclature of many derivative compounds necessitate departures from this system. Although the present study gives much evidence for the desirability of an entirely new system, the terminology herein is confined to that already in use. The nomenclature of this volume is also chosen with the intention of offering pictures of the structure which may be readily visualized.

A nomenclature system of basically different character has been proposed by Van Arsdell and Egloff,[2] and another was partially elucidated by Clar.[3] Both of these systems provide methods for simplifying problems of nomenclature, but neither is broad enough in scope to be applied to all compounds. The previously mentioned systems are compared in Table I.

The nomenclature proposed by either Van Arsdell and Egloff or Clar is more scientifically systematic than that of Patterson or that used in this volume. In the Van Arsdell and Egloff system, the general term *-zene* prefixed by the appropriate Greek numerical term designates a straight row of fused rings and, when further prefixed by *iso-*, a fused structure of the phenanthrene type. Clar makes use of the general term *-acene,* with the appropriate prefix, to designate straight row fusions and the term *-phene* for phenanthrene type structures. By using Roman numerals to designate the number of rings in each row, Clar's system can be extended to include compounds having one or more rings fused at an angle. According to Van Arsdell and Egloff, *peri*-fusions, as shown in example six, are defined by prefixing *peri-* to the *-zene* name. Despite the advantages of these systems, classical names such as phenanthrene, anthracene, and naphthacene are used in this volume to facilitate its use by scientists who are accustomed to thinking in terms of these names.

The use of letters to denote ring fusions, a point at which the present volume diverges from Patterson and Capell, will be treated in detail under a discussion on numbering and lettering. In a few cases, the basic names preferred by these authors are objectionable. Essentially different ones, therefore, are used. For example, the name "benzonaphthene," given to compound No. 6 in Table I, is scientifically ambiguous because the term "naphthene" is used indiscriminately throughout the literature to refer to several compounds and to a class of compounds.

In order to classify the compounds and name them with any degree of consistency, the name given in the literature is disregarded in many instances. Frequently the literature name bears no relation to the structure, is misleading, or actually defines the compound incorrectly. The names "phthalacene" and "isophthalacene," for example, give no clue to structure.

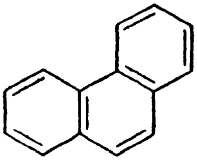
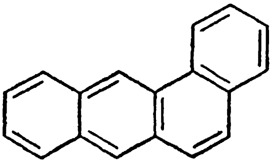
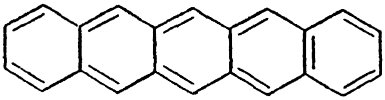
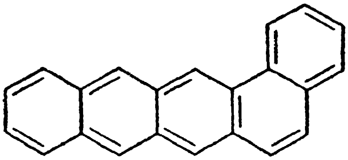
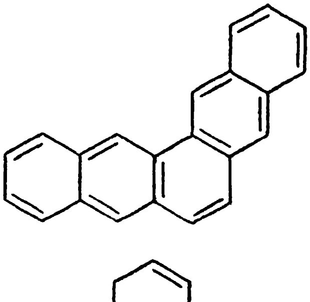
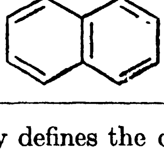
---

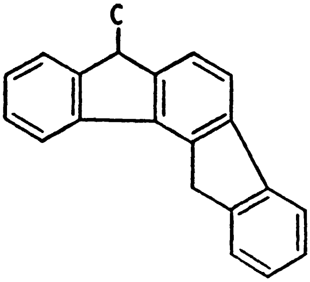
[1] Patterson, A. M., and L. T. Capell, "The Ring Index," Reinhold Publishing Corporation, New York, **1940.**

[2] Van Arsdell, P. M., and G. Egloff, "Nomenclature of Cyclic Hydrocarbons," paper presented before the American Chemical Society, Atlantic City, September, **1941.**

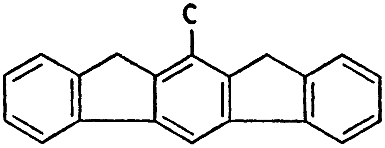
[3] Clar, E., "Aromatische Kohlenwasserstoffe," Springer-Verlag, Berlin, **1941.**

TABLE I

	Name used in Volume IV	Patterson	Egloff & Van Arsdell	Clar
1. 	Phenanthrene	Phenanthrene	Isotrizene	Triphene
2. 	1,2-Benzoanthracene	Benzo [a]anthracene	Isotetrazene	Tetraphene-(I, II)
3. 	Pentacene	Pentacene	Pentazene	Pentacene
4. 	1,2-Benzonaphthacene	Benzo[a]naphthacene	Isopentazene	Pentaphene-(I, III)
5. 	2,3,6,7-Dibenzophenanthrene	Dibenzo[bh]phenanthrene		Pentaphene-(II, II)
6. 	Phenalene	Benzonaphthene	Peritrizene	

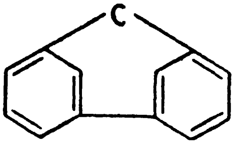


Phthalacene

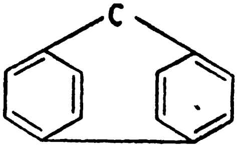


Isophthalacene

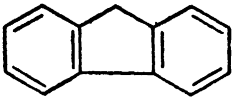
The many names assigned throughout the literature to fluorene and its derivatives provide illustrative examples of faulty nomenclature. Fluorene is often called "diphenylenemethane," a term applicable to more than one compound. The following structures, with which fluorene might be confused if named "diphenylenemethane", are also reported.[1] When the name "diphenylenemethane" is qualified by *o*-, *m*- or *p*- it has structural significance, but even then may be confused with "methylbiphenylenes" which have also been called "diphenylenes."



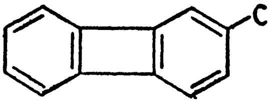
γ-Methylenediphenylene



δ-Methylenediphenylene



Fluorene or
o-Diphenylenemethane

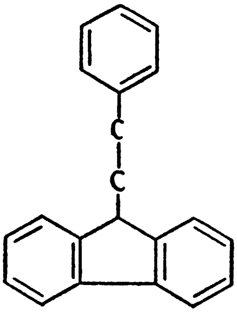


2-methylbiphenylene

The diphenylene terminology is particularly misleading when used in reference to fluorene derivatives. The following compound, which is named σ-phenethylfluorene in this volume, can be named as an ethane or propane according to the various methods of notation found in the literature:

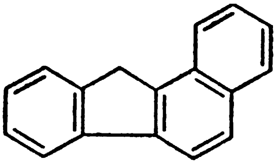
---

[1] Carnelley, T., J. Chem. Soc. **37**, 701 **1880**.

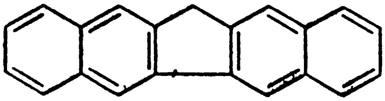


1-Diphenylene-3-phenylpropane
α-Diphenylene-γ-phenylpropane
or
1-(9′-Fluoryl)-2-phenylethane
α-9-Fluoryl-β-phenylethane

Among the incorrectly used names are chrysofluorene and dinaphthofluorenes. These terms imply a chryso- and two naphtho-fusions, respectively, on fluorene but are used almost exclusively in reference to benzo- and dibenzofluorenes.

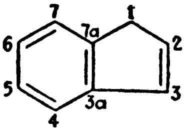


Chrysofluorene
α-Naphthofluorene
1,2-Benzofluorene

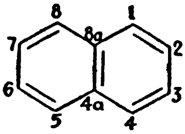


β,β-Dinaphthofluorene
2,3,6,7-Dibenzofluorene

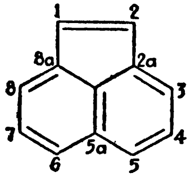
The explanation of the nomenclature used in the present study begins with consideration of nuclear structures. The following compounds with the indicated numbering are used as standard nuclei from which more complicated structures are built:



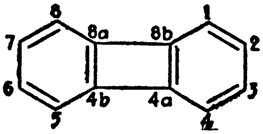
Indene
(2,3-dihydro form: Indane)



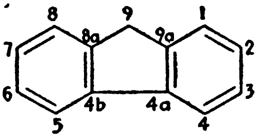
Naphthalene



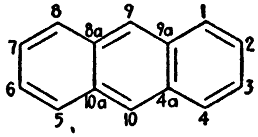
Acenaphthylene
(1,2-dihydro form: Acenaphthene)



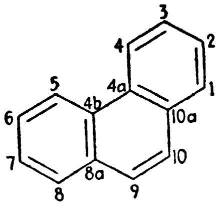
Biphenylene



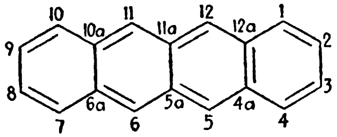
Fluorene



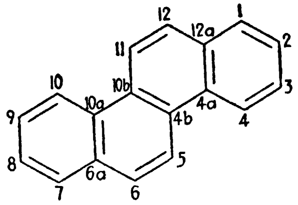
Anthracene



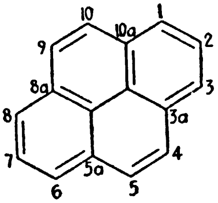
Phenanthrene



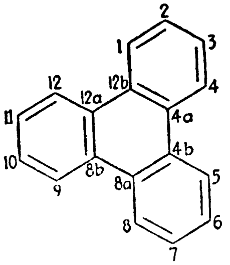
Naphthacene



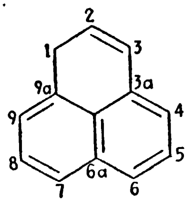
Chrysene



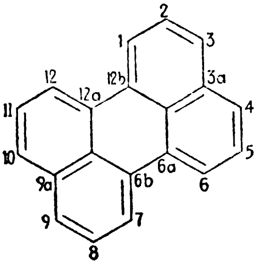
Pyrene



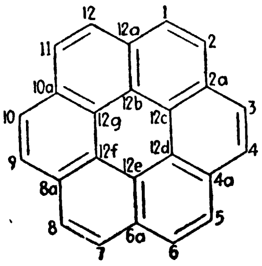
Triphenylene



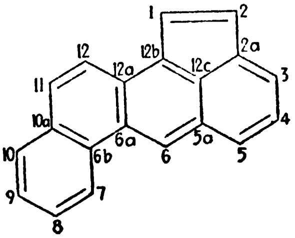
Phenalene
(2,3-dihydro form:
Phenalan)



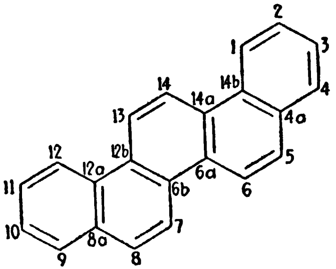
Perylene

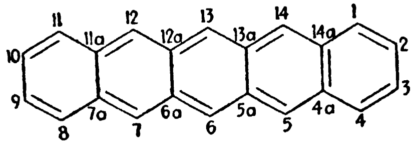


Coronene



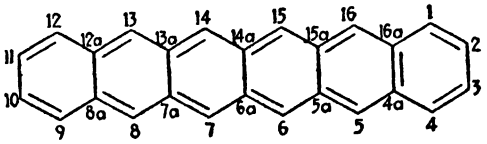
Cholanthrylene
(1,2-dihydro form:
Cholanthrene)





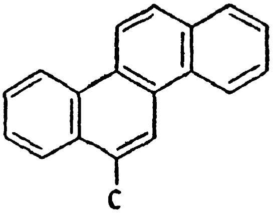
Pentacene

Picene



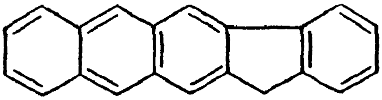
Hexacene

The least hydrogenated forms are considered parent except for the specified dihydro forms of indene, acenaphthylene, phenalene, and cholanthrylene. The largest of these nuclei contained in a given compound is considered as the nuclear structure of that compound. For example, the following structure is named 6-methylchrysene in preference to 1,2-benzo-3-methylphenanthrene.



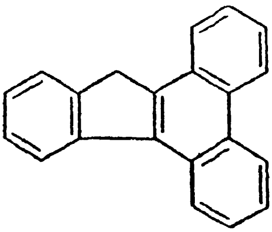
6-Methylchrysene

Because anthracene is a larger nucleus then fluorene, 2,3-(3′,2′-indo)-anthracene rather than 2,3-(3′,2′-naphtho)-fluorene is assigned to the following structure.



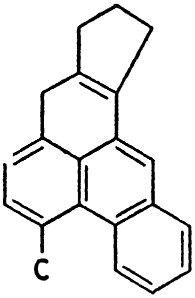
2,3-(3′,2′-Indo)-anthracene

Exception to this ruling is made, however, when the exception results in a decided simplification of the name. Prime numbering, for example, can be eliminated by naming the following structure 1,2,3,4-dibenzofluorene instead of 9,10-(2′,3′-indo)-phenanthrene.



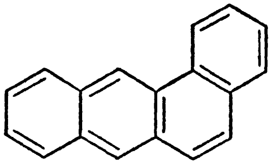
1,2,3,4-Dibenzofluorene

Likewise, 2,3-cyclopentano-5,6-benzo-7-methylphenalene includes only one set of numbers while cyclopentano-[a]-(6′-methylbenzo)-[de]-3-hydroanthracene necessitates the use of letters and two sets of numbers.



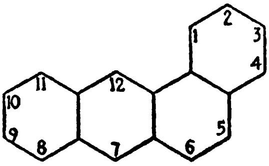
2,3-Cyclopentano-5,6-benzo-7-methylphenalene

When two parent nuclei of the same size are possible, the one having the greatest number of rings in a horizontal row is chosen as the parent nucleus. For example, 1,2-benzoanthracene is preferred to 2,3-benzophenanthrene.



1,2-Benzoanthracene

Many authors number compounds such as 1,2-benzoanthracene with a single set of numbers.



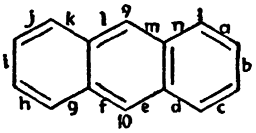
1,2-Benzoanthracene[1]

Although this system is advantageous in many respects, it brings in complications when derivative compounds are named. According to this plan, a methyl radical substituted on the benzo group has the number 2-, 3-, or 4- which is ambiguous because 1- and 2- are also used to describe the position of the benzo group on anthracene.

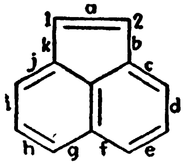
The positions of fused substituents cannot be indicated by numerical notations with simplicity when more than one side of the substituent is common to the parent nucleus. In these cases, letters designate the sides of fusion. The letter "a" represents the side between the 1- and 2-positions, "b" the next side

[1] Patterson, A. M., and L. T. Capell, "The Ring Index," Reinhold Publishing Corporation, New York, **1940**.

of the formula and so on in alphabetical order. The positions described by letters are illustrated in the following:

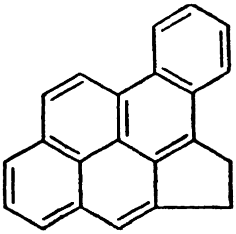


Anthracene



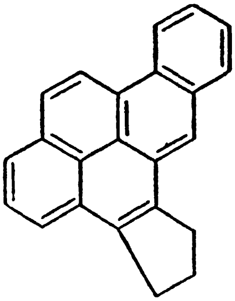
Acenaphthylene

When a compound has two or more fused substituents, only one of which can be designated by numbers, letters are used for all.



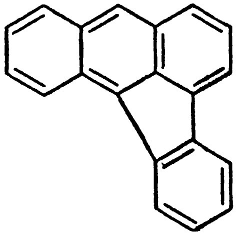
Benzo-[a]-cyclopentano-[cd]-pyrene
not
1,2-Benzocyclopentano-[cd]-pyrene

When all fused substituents are fused to only one side of the nucleus, the positions are indicated by numbers rather than letters.

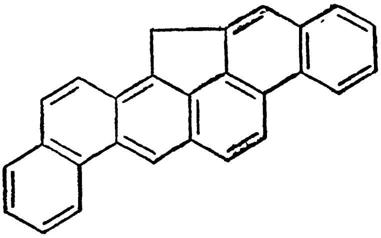


1,2-Benzo-4,5-cyclopentanopyrene
not
Benzo-[a]-cyclopentano-[e]-pyrene

All fused substituents other than benzene which require the use of letters, must have a second series of letters or a set of numbers to indicate the positions of carbons relative to the substituent itself. These positions are stated in numbers and are inscribed within brackets preceding the letters used to designate the position of fusion on the nucleus as illustrated in the following examples.

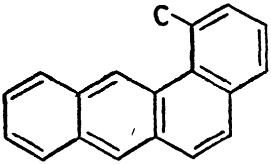


Indo-[3,2,1-de]-anthracene

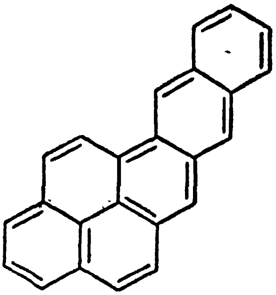


Naphtho-[3,2,1-bc]-cholanthrene

All numbering and lettering is clockwise except for a few instances which will be explained later.[1] The initial point of numbering on the substituent nucleus is situated so that the carbon atoms common to both the parent and substituent nuclei have the lowest possible numbers consistent with standard numbering. Thus the nomenclature for the following structures is:

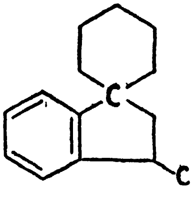


1,2-(3′-Methylbenzo)-anthracene
not
6,7-(3′-Methylbenzo)-anthracene



1,2-(3′,2′-Naphtho)-pyrene
not
6,7-(3′,2′-Naphtho)-pyrene

For spiro compounds, essentially the same rules apply and the spiro atom is assigned the lowest possible number.

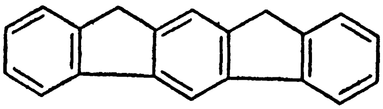


Spiro [3-methylindane-1,1′-cyclohexane]
not
Spiro [1-methylindane-3,1′-cyclohexane]

Counterclockwise numbering is used for substituent nuclei when clockwise numbering involves a change in the standard numbering. For example, the use of clockwise numbers for the indo-substituent of 2,3-(2′,3′-indo)-fluorene would involve numbering the saturated carbon as 3′- rather than 1′-, the standard position.

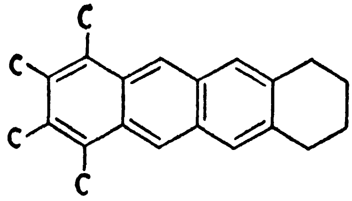
---

[1] See Patterson and Capell, "The Ring Index" p. 24. The formula for 7-benz-[de]-anthracene is numbered clockwise but lettered counter clockwise. Many examples similar to this are found in the names of preference given in "The Ring Index."



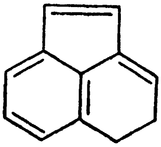
2,3-(2′,3′-Indo)-fluorene

The principle of assigning the lowest possible numbers or letters to substituents is followed in this volume as it is for the mononuclear aromatics. For detailed explanation of alkyl and alicyclic derivatives, see the Introduction to Volume III. The problems encountered in numbering the various nuclei of this volume complicate somewhat the general application of the system used for the mononuclears. The nuclear systems must be numbered in accordance with the previous discussion before the rules for using lowest possible numbers are applied. In this volume, there is an exception to this rule. When a partially hydrogenated nuclear structure can be numbered from more than one starting point, the hydrogenated positions are always assigned the lowest numbers. In the naming of the compound, these hydrogen atoms are designated immediately preceding the name of the nuclear structure even though the numbers referring to other substituents are higher.



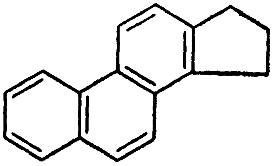
7,8,9,10-Tetramethyl - 1,2,3,4-tetrahydronaphthacene
not
1,2,3,4-Tetramethyl - 7,8,9,10-tetrahydronaphthacene
nor
1,2,3,4-Tetrahydro - 7,8,9,10-tetramethylnaphthacene

This rule is not followed, however, when assignment of lowest numbers to the hydrogen atoms involves changing of the standard numbering of a ring system.



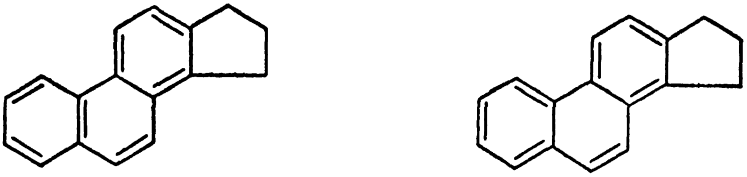
4,5-Dihydroacenaphthylene
not
1,2-Dihydroacenaphthylene

Frequently in the literature, a cyclane fused to an aromatic nucleus was names as a cycleno-compound. Although the side common to the nucleus and the substituent has, at least in some of the resonance structures, a double bond, the substituent is called cyclano- in this volume. For example, the following structure is named 1,2-cyclopentanophenanthrene even though it is frequently referred to as a 1,2-cyclopentenophenanthrene in the literature.



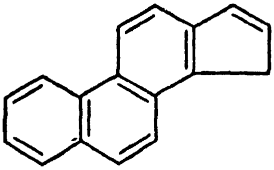
1,2-Cyclopentanophenanthrene

Assuming other resonance structures of phenanthrene, a double bond will not always exist on the common side.



Two other resonance structures for 1,2-Cyclopentanophenanthrene

By naming the five carbon ring cyclopentano-, confusion is avoided with such structures as 1,2-(cyclopenten-3′-o)-phenanthrene.

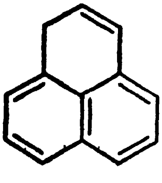


1,2-(Cyclopenten-3′-o)-phenanthrene

If cyclopenteno- were used for the former structure, cyclopentadieno- would necessarily be used for the latter.

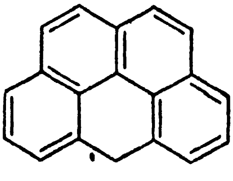
The notation of all possible resonance structures is not practical for this publication. Inclusion of double bonds in the formulae, however, is necessary to indicate the extent of saturation. Double bonds are, therefore, assigned arbitrarily in order to distinguish partially hydrogenated compounds from the others.

Peri-fused benzene ring structures, of which phenalene is the simplest, always have one saturated carbon atom.



Phenalene

In this study, the name given to such compounds, except for those included in the list of nuclear structures, specifies the saturated carbon atom by prefixing the appropriate number to -hydro-. For example, the following compound is named benzo-[cd]-5-hydropyrene.



Benzo-[cd]-5-hydropyrene

Order of Tabulating Compounds

The order used for the tabulation in this volume will be explained to facilitate the location of compounds. Constants have been determined on a wide variety of nuclear structures and derivatives thereof. For only a few nuclear structures, however, have sufficient derivatives of one type (*i.e.* alkyl, alkenyl, phenyl, diphenyl, etc.) been prepared to warrant the classification of these into a separate section. Consequently, a highly arbitrary system is devised for the classification and the order of listing compounds.

All compounds having a common empirical formula are classified in one group. These groups are numbered with Roman numerals and listed in order of decreasing hydrogen content. All compounds of empirical formula C_nH_{2n-8}, for example, are tabulated under I; compounds of formula C_nH_{2n-10} are listed under II, etc.

Groups I through XV are divided into sections denoted by Arabic numerals. These subdivisions are made when a lengthy series of compounds having a single nuclear structure or very similar nuclear structures is found. The section including the smallest nuclear structure is tabulated under 1., the next under 2., etc. Thus under Group VII are listed:

1. Indene derivatives of empirical formula C_nH_{2n-20}.
2. Naphthalene derivatives of empirical formula C_nH_{2n-20}.
3. Cyclanoanthracenes and their alkyl derivatives.
4. Cyclanophanenthrenes and their alkyl derivatives.
5. Miscellaneous polynuclears of empirical formula C_nH_{2n-20}.

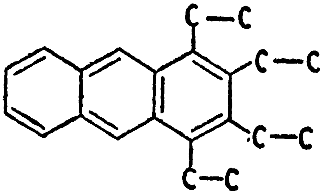
When nuclei of two or more sections are of the same size, the section composed of derivatives of the nucleus having the longest straight row of rings precedes the others. Under Group IX, for example, section 5 is naphthacene and its alkyl derivatives, section 6 is chrysene and its alkyl derivatives, etc.

Except for sections entitled miscellaneous and a few sections in which general classification is simplified by listing together such similar compounds as anthracene and phenanthrene derivatives, the compounds of one section have a common nucleus. The compounds are listed in these sections:

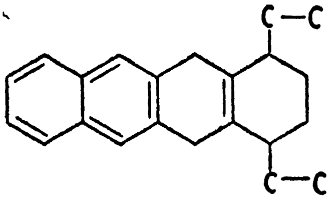
1. In increasing order of carbon content, *i.e.* C_{12} compounds precede C_{13} compounds etc.
2. In order of increasing number of substituents, *i.e.* propyl precedes methyl plus ethyl which precedes trimethyl.
3. In order of increasing complexity of substituents, *i.e.* *n*-butyl precedes *sec*-butyl which precedes *tert*-butyl. For more detailed explanation see Introduction to Volume III.
4. In order of increasing numerical sum of the numbers describing substituent positions, *i.e.* 2,3,5-trimethylnaphthalene precedes 1,2,8-trimethylnaphthalene. If the sum is equal, the compound bearing the lowest number is placed first, *i.e.* 1,4-dimethylnaphthalene precedes 2,3-dimethylnaphthalene.

The order of tabulating compounds in the miscellaneous groups or sections is more complicated. These hydrocarbons are listed primarily in order of increasing carbon content. After this qualification has been fulfilled, the general order follows:

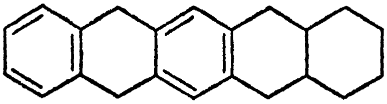
1. In order of increasing number of rings, *i.e.*, anthracene derivatives precede hexahydronaphthacene derivatives which precede decahydropentacene etc.



(1) 1,2,3,4-Tetraethylanthracene

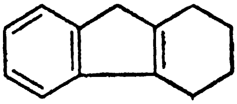


(2) 1,4-Diethyl-1,2,3,4,5,12-hexahydronaphthacene

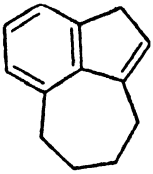


(3) 1,2,3,4,4a,5,7,12,14,14a-Decahydropentacene

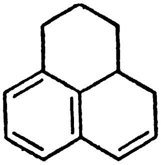
2. In order of increasing size of rings, *i.e.* a compound having one five- and two six-membered rings precedes one having one five-, one six-, and one seven-membered rings which precedes one having three six-membered rings.



(1) 1,2,3,4-Tetrahydrofluorene (1-5C and 2-6C rings)

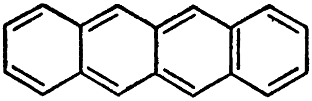


(2) Cycloheptano-[cd]-indene (1-5C, 1-6C and 1-7C rings)

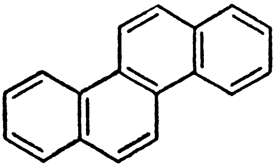


(3) 3a,4-Dihydrophenalan (3-6C rings)

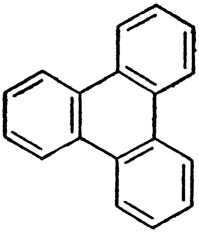
3. In order of increasing number of rings fused at angles, *i.e.*, naphthacene precedes chrysene which precedes triphenylene, etc.



(1) Naphthacene



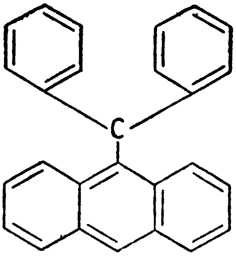
(2) Chrysene



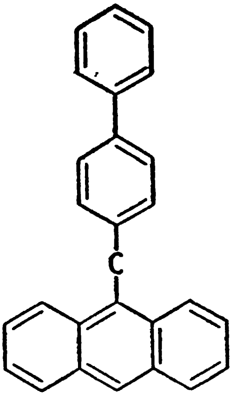
(3) Triphenylene

The foregoing general principles, however, are not sufficient for determining order in every case. Further discussion follows to clarify special problems which arise after the general principles have been followed.

Benzhydrylpolynuclears precede polynuclear biphenylylmethane. For example, 9-benzhydrylanthracene precedes 9-anthryl-*p*-biphenylylmethane.

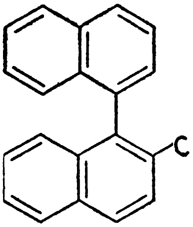


(1) 9-Benzhydrylanthracene

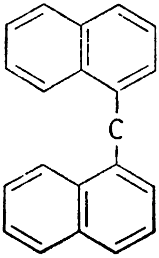


(2) 9-Anthryl-*p*-biphenylylmethane

Biaryls are listed preceding diarylaliphatics, *i.e.*, 2-methyl-1,1′-binaphthyl precedes di-1-naphthylmethane.

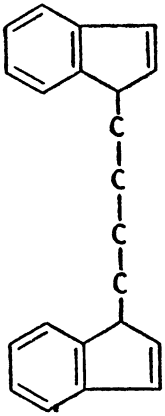


(1) 2-Methyl-1,1′-binaphthyl

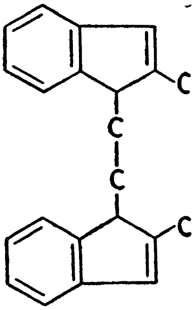


(2) Di-1-naphthylmethane

Diarylaliphatics, however, precede dialkyldiarylaliphatics. Thus 1,4-di-(1′-indenyl)-butane is listed before 1,2-di-[1′-(2′-methylindenyl)]-ethane.

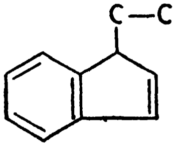


(1) 1,4-Di-(1′-indenyl)-butane

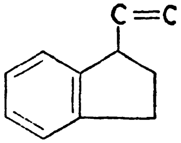


(2) 1,2-Di-[1′-(2′-methylindenyl)]-ethane

When two polynuclear nuclei have the same carbon structure, the least hydrogenated nucleus is tabulated first. As an illustration, 1-ethylindene precedes 1-ethenylindane.

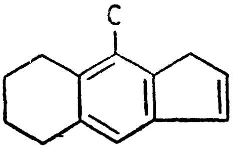


(1) 1-Ethylindene

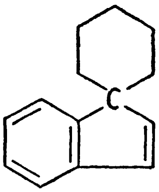


(2) 1-Ethenylindane

Spiro compounds follow others having rings of equivalent number and size. Both 7-methyl-5,6-cyclohexanoindene and spiro [indene-1,1′-cyclohexane] have fourteen carbon atoms and are named with reference to indene as the largest nucleus. They also have an equivalent number of rings of the same size. According to our arbitrary decision, the spiro compound is listed last.

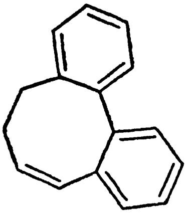


(1) 7-Methyl-5,6-cyclohexanoindene
(1–5C and 2–6C rings)

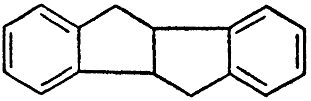


(2) Spiro [indene-1,1′-cyclohexane]
(1–5C and 2–6C rings)

In the assignment of positions in the present tabulation, *endo-* and *bicyclo-* structures are considered to be two rings. A dibenzocyclooctene, therefore, would precede a dibenzobicyclooctane because the latter has four rings (2–5C and 2–6C) while the former has only three rings (1–8C and 2–6C).

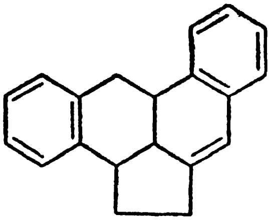


(1) 1,2,3,4-Dibenzocyclooctene-5

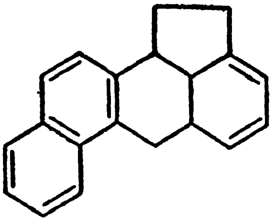


(2) 2,3,6,7-Dibenzobicyclo-[3,3,0]-octane

When two compounds have the same number of rings of the same size, but are not named as derivatives of the same nucleus, the compound having the name with the smallest parent nucleus is tabulated first. For example, benzo-[a]-cyclopentano-[de]-4a,9,9a,10-tetrahydroanthracene precedes 5a,6,12b,12c-tetrahydrocholanthrene.

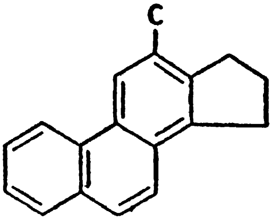


(1) Benzo-[a]-cyclopentano-[de]-4a,9,9a,10-tetrahydroanthracene

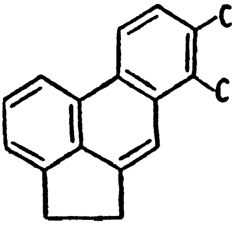


(2) 5a,6,12b,12c-Tetrahydrocholanthrene

When two compounds have nominally identical ring structures, but one compound has a larger ring structure because of the difference in position of a fused substituent, the compound having the least total substituents is recorded first. For example, 1,2-cyclopentano-3-methylphenanthrene precedes cyclopentano-[jk]-1,2-dimethylphenanthrene.



(1) 1,2-Cyclopentano-3-methylphenanthrene



(2) Cyclopentano-[jk]-1,2-dimethylphenanthrene

A review of the Introduction to Volume III is suggested to clarify the order of tabulation of compounds when aliphatic and alicyclic substituents are involved.

I. BENZOCYCLANES, C_nH_{2n-8}

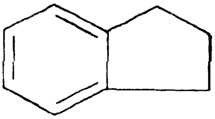
1. Indane and Its Alkyl Derivatives
2. Tetrahydronaphthalene and Its Alkyl Derivatives
3. Higher Benzocyclanes

1. INDANE AND ITS ALKYL DERIVATIVES, C_nH_{2n-8}

C_9H_{10}

Indane

(Hydrindene)



M. P., °C

−51.4[12]

B. P., °C @ 760mm

177	
176–180[44]	
177.5–178.5[13]	
177–178[30]	
175.5–177.5[53]	
177.0[33]	
177[14, 27, 29]	
176–177[34]	
176–176.5[52]	
176.25[33]	
176[2, 47]	
174–176[19, 23]	
177–181	771[28]
177–178	764[25]
176–176.5	762[22]
174–174.5	751.5[26]
176–176.5	742[8]
79.0	29[12]
51	14[38]
66.5	13[21]
55	11[40]

D_4^{20}

0.9639[13]	
0.9645[2]	
0.8942	100° [13]
0.9378	50° [13]
0.9560	25° [40]
0.9599	25° [40]
0.9507	D_{25}^{25} [33, 34]
0.9559	D_{25}^{25} [34]
0.9582	D_{25}^{25} [33]
0.9536	D_{20}^{20} [33, 34]
0.9601	D_{20}^{20} [33]
0.9611	D_{20}^{20} [34]
0.9547	19.5° [53]
0.96250	16.4° [33]
0.957	15° [22, 52]
0.9570	D_{15}^{15} [33, 34]
0.960	D_{15}^{15} [19]
0.9645	D_{15}^{15} [33, 34]
0.95980	10.6° [33]
0.9606	D_{10}^{10} [34]
0.9681	D_{10}^{10} [33, 34]
0.9646	D_5^5 [33]
0.9723	D_5^5 [33]
0.9656	D_4^4 [33]
0.9732	D_4^4 [33]
0.9813	0° [13]

n_D^{20}

1.5381[2]	
1.5383[13]	
1.5352	25° [40]
1.5355	25° [40]
1.5351_2	20.8° [9]
1.5382	20.7° [12]
1.53877	19.25° [34]
1.5381	17.9° [21]
1.53877	16.4° [33]
1.53896	15.95° [34]
1.5407	15° [13]
1.5303_8	$n_{H\alpha}^{20.8}$ [9]
1.53394	$n_{H\alpha}^{19.25}$ [34]
1.53394	$n_{H\alpha}^{16.4}$ [33]
1.53431	$n_{H\alpha}^{15.95}$ [34]
1.53431	$n_{H\alpha}^{10.6}$ [33]

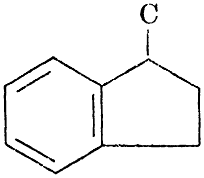
1.5471_3	$n_{\mathrm{H}\beta}^{20.8\ \ 9}$
1.55114	$n_{\mathrm{H}\beta}^{19.25\ \ 34}$
1.55114	$n_{\mathrm{H}\beta}^{16.4\ \ 33}$
1.55105	$n_{\mathrm{H}\beta}^{15.95\ \ 34}$
1.55105	$n_{\mathrm{H}\beta}^{10.6\ \ 33}$
1.56136	$n_{\mathrm{H}\gamma}^{19.25\ \ 34}$
1.56136	$n_{\mathrm{H}\gamma}^{16.4\ \ 33}$
1.56154	$n_{\mathrm{H}\gamma}^{15.95\ \ 34}$
1.56154	$n_{\mathrm{H}\gamma}^{10.6\ \ 33}$

(a)

(a) Refractive indices at other lines are found in references 33, 34.

$C_{10}H_{12}$

1-Methylindane



B. P., °C @ 760mm

186–187^{31}	
182–183^{16}	
182^{47}	
60–64	12^{40}
60	10^{40}

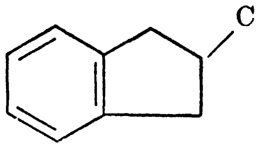
D_4^{20}

0.940^{37}	
0.9402^{40}	
0.9407^{31}	
0.9383	25° ^{40}
0.947	21° ^{40}
0.9661	16° ^{46}

n_D^{20}

1.5222^{40}	
1.5260^{37}	
1.52742^{31}	
1.5204	25° ^{40}
1.53938	16° ^{46}

2-Methylindane



B. P., °C @ 760mm

183–185	747^{20}
70	10^{40}
69	10$^{37,\ 40}$

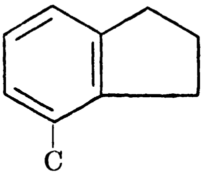
D_4^{20}

0.932^{37}	
0.9317	25° ^{40}
0.9318	23° ^{40}
0.9321	22° ^{40}
0.9034	D_0^{17} ^{20}

n_D^{20}

1.5235^{37}	
1.5189	25° ^{40}
1.5200	23° ^{40}
1.5224	22° ^{40}

4-Methylindane



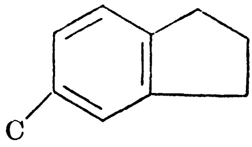
B. P., °C @ 760mm

203^{24}

D_4^{20}

0.9350^{24}

5-Methylindane



B. P., °C @ 760mm

74	11^{35}

D_4^{20}

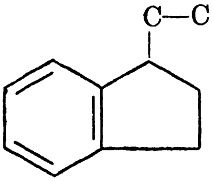
0.9494[35]

n_D^{20}

1.5332[35]

$C_{11}H_{14}$

1-Ethylindane



B. P., °C @ 760mm

212[39]	
84	12[40]

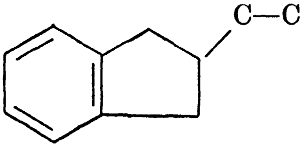
D_4^{20}

0.9348	25° [39]
0.9346	23° [40]

n_D^{20}

1.5202	23° [40]
1.52286	n_{He}^{25} [39]

2-Ethylindane



B. P., °C @ 760mm

86	12[40]

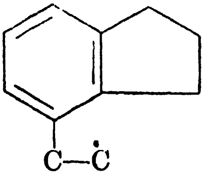
D_4^{20}

0.9266	24° [40]

n_D^{20}

1.5160	24° [40]

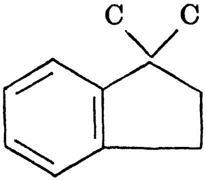
4-Ethylindane



B. P., °C @ 760mm

125–130	43[5]
71–72	2.5[5]

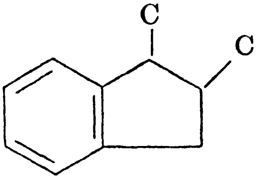
1,1-Dimethylindane



B. P., °C @ 760mm

191[1]

1,2-Dimethylindane



B. P., °C @ 760mm

79.80	10[37]

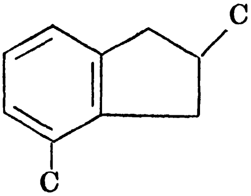
D_4^{20}

0.927[37]

n_D^{20}

1.5186[37]

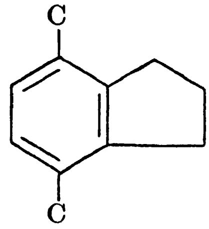
2,4-Dimethylindane



B. P., °C @ 760mm

105–106	25[4]
100–105	23[3]

4,7-Dimethylindane



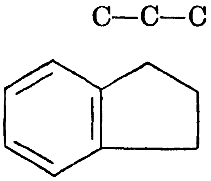
B. P., °C @ 760mm
94–97 10[37]
94 10[36]

D_4^{20}
0.949[37]

n_D^{20}
1.5342[37]
1.5346[36]

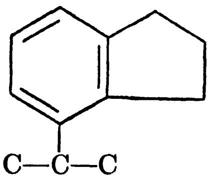
$C_{12}H_{16}$

1-Isopropylindane



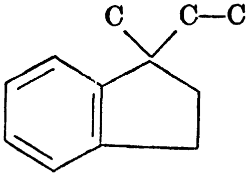
B. P., °C @ 760mm
98–100 17[10]

4-Isopropylindane



B. P., °C @ 760mm
88–90 1[3, 6]

1-Methyl-1-ethylindane

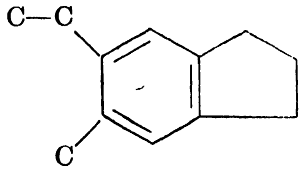


B. P., °C @ 760mm
218[39]

D_4^{20}
0.9232 25° [39]

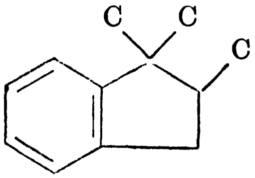
n_D^{20}
1.51563 n_{He}^{25} [39]

5-Methyl-6-ethylindane



B. P., °C @ 760mm
112–116 11[A]

1,1,2-Trimethylindane

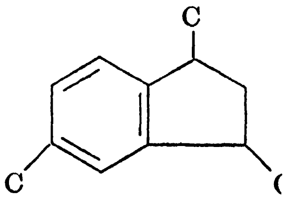


B. P., °C @ 760mm
208[1, 11]

D_4^{20}
0.919[11]

n_D^{20}
1.5137[11]

1,3,5-Trimethylindane



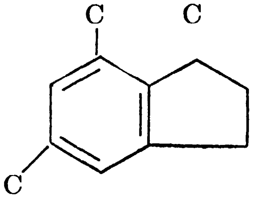
B. P., °C @ 760mm

98–99 14[51]

n_D^{20}

1.5206[51]

1,5,7-Trimethylindane



B. P., °C @ 760mm

104–105 14[50]

n_D^{20}

1.5231 25°[50]

$C_{13}H_{18}$

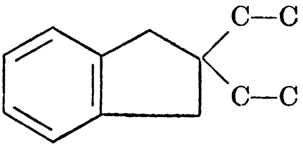
x-Butylindane (a)

B. P., °C @ 760mm

238[32]

(a) The structure of this compound was not clearly defined in the literature.

2,2-Diethylindane



B. P., °C @ 760mm

118 16[17]

D_4^{20}

0.9162[17]

0.9295 13.4°[45]

n_D^{20}

1.5135 25°[17]

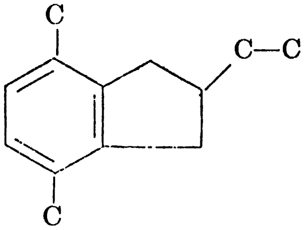
1.51406 $n_{H\alpha}^{13.4}$[45]

1.52792 $n_{H\beta}^{13.4}$[45]

1.53643 $n_{H\gamma}^{13.4}$[45]

1.51820 $n_{He}^{13.4}$[45]

2-Ethyl-4,7-dimethylindane



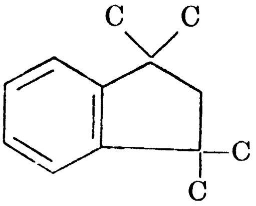
B. P., °C @ 760mm

84–85 0.1[49]

n_D^{20}

1.5207 22°[49]

1,1,3,3-Tetramethylindane

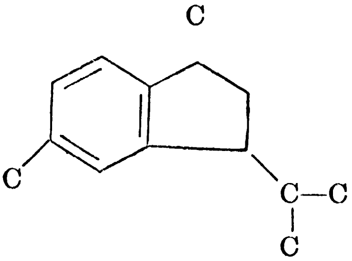


B. P., °C @ 760mm

206–209[1]

$C_{14}H_{20}$

1,5-Dimethyl-3-isopropylindane



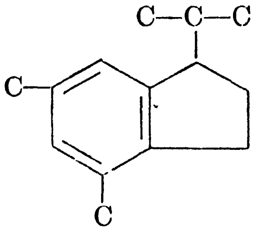
B. P., °C @ 760mm

115–16 10[51]

n_D^{20}

1.5179 21°[51]

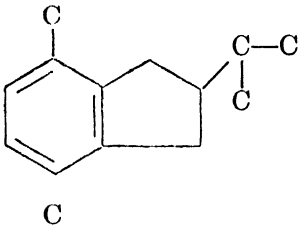
1-Isopropyl-4,6-dimethylindane



B. P., °C @ 760mm	
118–120	0.3[48]

n_D^{20}	
1.5215	22.5° [48]

2-Isopropyl-4,7-dimethylindane



M. P., °C

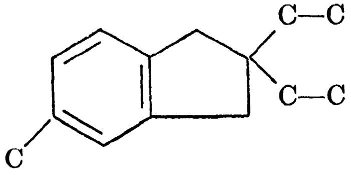
23–24[41]

B. P., °C @ 760mm	
108–110	3[41]

n_D^{20}

1.518[41]

2,2-Diethyl-5-methylindane



B. P., °C @ 760mm	
123–127	12[15]

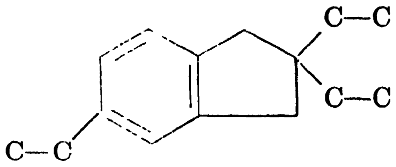
D_4^{20}	
0.9197	21.5° [15]

n_D^{20}

1.51055[15]

$C_{15}H_{22}$

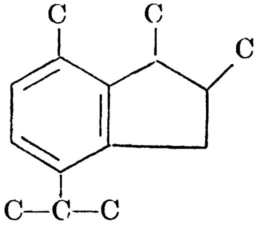
2,2,5-Triethylindane



D_4^{20}	
0.9178	16.2° [45]
0.9250	14.05° [45]

n_D^{20}	
1.51081	$n_{H\alpha}^{16.2}$ [45]
1.51323	$n_{H\alpha}^{14.05}$ [45]
1.52426	$n_{H\beta}^{16.2}$ [45]
1.52679	$n_{H\beta}^{14.05}$ [45]
1.53242	$n_{H\gamma}^{16.2}$ [45]
1.53522	$n_{H\gamma}^{14.05}$ [45]
1.51473	$n_{He}^{16.2}$ [45]
1.51741	$n_{He}^{14.05}$ [45]

1,2,7-Trimethyl-4-isopropylindane

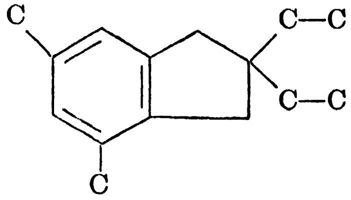


B. P., °C @ 760mm	
154–155	29[7]

D_4^{20}	
0.9250	D_{25}^{25} [7]

n_D^{20}	
1.5112	25° [7]

2,2-Diethyl-4,6-dimethylindane

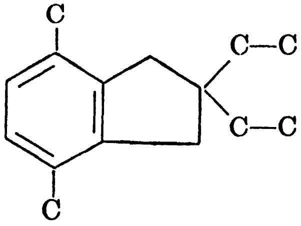


B. P., °C @ 760mm

265–270[18]

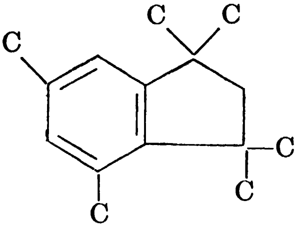
260–265[18]

2,2-Diethyl-4,7-dimethylindane



B. P., °C @ 760mm	
140–141	13[16]
D_4^{20}	
0.923[16]	
n_D^{20}	
1.51592[16]	

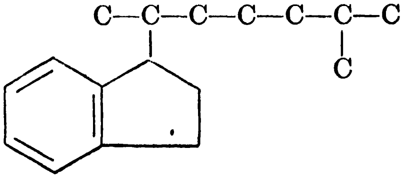
1,1,3,3,4,6-Hexamethylindane



B. P., °C @ 760mm	
114–117	13[43]
D_4^{20}	
0.901	31° [43]
0.905	D_{31}^{31} [43]
n_D^{20}	
1.5100	28.5° [43]

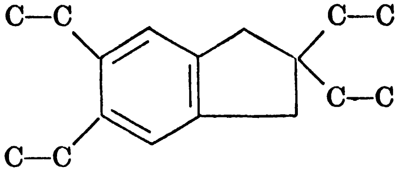
$C_{17}H_{26}$

2-Methyl-6-indanylheptane



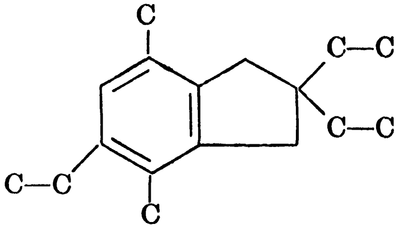
B. P., °C @ 760mm	
100–102	0.2[40]
D_4^{20}	
0.9083	19° [40]
n_D^{20}	
1.5065	19° [40]

2,2,5,6-Tetraethylindane



D_4^{20}	
0.9246	14.35° [45]
n_D^{20}	
1.51582	$n_{H\alpha}^{14.35}$ [45]
1.52935	$n_{H\beta}^{14.35}$ [45]
1.53776	$n_{H\gamma}^{14.35}$ [45]
1.51998	$n_{He}^{14.35}$ [45]

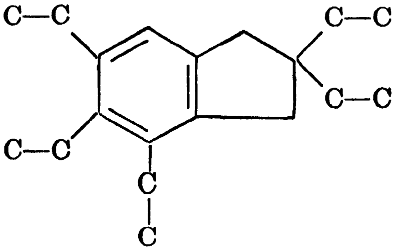
2,2,5-Triethyl-4,7-dimethylindane



B. P., °C @ 760mm	
163–164	14[17]
D_4^{20}	
0.916[17]	
n_D^{20}	
1.51592[17]	

$C_{19}H_{30}$

2,2,4,5,6-Pentaethylindane



D_4^{20}

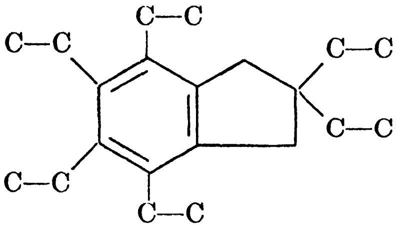
0.9234	14.1° [45]

n_D^{20}

1.51702	$n_{H\alpha}^{14.1}$ [45]
1.53043	$n_{H\beta}^{14.1}$ [45]
1.53878	$n_{H\gamma}^{14.1}$ [45]
1.52115	$n_{He}^{14.1}$ [45]

$C_{21}H_{34}$

2,2,4,5,6,7-Hexaethylindane



D_4^{20}

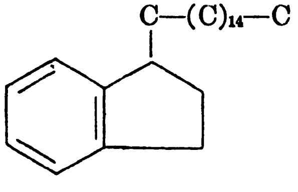
0.9263	14.3° [45]

n_D^{20}

1.51856	$n_{H\alpha}^{14.3}$ [45]
1.53198	$n_{H\beta}^{14.3}$ [45]
1.54022	$n_{H\gamma}^{14.3}$ [45]
1.52265	$n_{He}^{14.3}$ [45]

$C_{25}H_{42}$

1-*n*-Hexadecylindane



M. P., °C

33.1[42]

B. P., °C @ 760mm

206.5	1.00[42]
191.5	0.50[42]

D_4^{20}

0.8333	98.9° [42]
0.8587	60° [42]
0.8738	37.8° [42]

n_D^{20}

1.4941[42]	
1.4863	40.0° [42]
1.4902	30.0° [42]

References on Indane and Its Alkyl Derivatives

A. Arnold, R. T., and R. A. Barnes, J. Am. Chem. Soc. **66,** 960 **1944.**

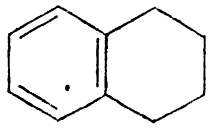
1. Bogert, M. T., and D. Davidson, J. Am. Chem. Soc. **56,** 185 **1934.**
2. Borsche, W., and M. Pommer, Ber. **54,** 102 **1921.**
3. Bruce, W. F., J. Am. Chem. Soc. **60,** 2277 **1938.**
4. Bruce, W. F., and L. F. Fieser, J. Am. Chem. Soc. **59,** 479 **1937.**
5. Bruce, W. F., and S. J. Kahn, J Am. Chem. Soc. **60,** 1017 **1938.**
6. Bruce, W. F., and F. Todd, J. Am. Chem. Soc. **61,** 157 **1939.**
7. Carter, C. L., and S. N. Slater, J. Chem. Soc. **1938,** 546.
8. Clemmensen, E., Ber. **47,** 681 **1914.**
9. Cotton, A., and H. Mouton, Ann. chim. phys. [8] **28,** 209 **1913.**
10. Courtot, C., Ann. chim. [9] **5,** 52 **1916.**
11. Davidson, D., and J. Feldman, J. Am. Chem. Soc. **66,** 488 **1944.**
12. Dolliver, M. A., T. L. Gresham, G. B. Kistiakowsky, and W. E. Vaughan, J. Am. Chem. Soc. **59,** 831 **1937.**
13. Evans, E. B., J. Inst. Petroleum Tech. **24,** 537 **1938.**
14. Fichter, F., and H. Stenzl, Helv. Chim. Acta **22,** 425 **1939.**
15. Fleischer, K., and W. W. Melber, Ann. **422,** 242 **1921.**
16. Freund, M., and K. Fleischer, Ann. **411,** 14 **1916,**

17. Freund, M., K. Fleischer, and F. Gofferjé, Ann. **414,** 1 **1918.**
18. Freund, M., K. Fleischer, and M. Praetorius, Ann. **411,** 20 **1916.**
19. Hall, C. C., J. Soc. Chem. Ind. **54,** 208 **1935–1936.**
20. Kizhner, N., J. Russ. Phys. Chem. Soc. **46,** 1411 **1914;** C.A. **9,** 2066 **1915.**
21. Kohlrausch, K. W. F., and R. Seka, Ber. **71,** 1551 **1938.**
22. Krämer, G., and A. Spilker, Ber. **23,** 3276 **1890.**
23. Krämer, G., and A. Spilker, Ber. **33,** 2257 **1900.**
24. Kruber, O., Ber. **57,** 1008 **1924.**
25. Lebeau, P., and M. Picon, Compt. rend. **173,** 84 **1921.**
26. Lozovoĭ, A. V., M. K. Diakova, and T. G. Stepanzeva, J. Gen. Chem. (U S.-S.R.) **9,** 540 **1939.**
27. Mameli, E., and A. Mossini, Giorn. chim. ind. applicata **15,** 161 **1933.**
28. McVicker, W. H., J. K Marsh, and A. W. Stewart, J. Chem. Soc. **125,** 1743 **1924.**
29. Meyer, R., and W. Meyer, Ber. **51,** 1571 **1918.**
30. Moschner, J., Ber. **33,** 737 **1900.**
31. Nenitzescu, C. D., and E. Cioranescu, Ber. **69,** 1040 **1936.**
32. Noelting, E., Chimie & industrie **6,** 719 **1921.**
33. Perkin, W. H., J. Chem. Soc. **69,** 1025 **1896.**
34. Perkin, W. H., Jr., and G. Révay, J. Chem. Soc. **65,** 228 **1894.**
35. Plattner, P. A., and H. Roniger, Helv. Chim. Acta **25,** 590 **1942.**
36. Plattner, P. A., and H. Roniger, Helv. Chim. Acta **25,** 1077 **1942.**
37. Plattner, P. A., and J. Wyss, Helv. Chim. Acta **24,** 483 **1941.**
38. Ramart-Lucas, and J. Hoch, Bull. soc. chim. [5] **2,** 327 **1935.**
39. Roblin, R., Jr., D. Davidson, and M. T. Bogert, J. Am. Chem. Soc. **57,** 151 **1935.**
40. Ruzicka, L., and E. Peyer, Helv. Chim. Acta **18,** 676 **1935.**
41. St. Pfau, A., and P. Plattner, Helv. Chim. Acta **22,** 202 **1939.**
42. Schiessler, R. W., D. G. Clarke, C. S. Rowland, W. S. Sloatman, and C. H. Herr, preprint of paper presented at Am. Petroleum Inst., Nov. 10, **1943.**
43. Smith, L. I., and L. J. Spillane, J. Am. Chem. Soc. **65,** 202 **1943.**
44. Stoermer, R., and J. Boes, Ber. **33,** 3013 **1900.**
45. von Auwers, K., Ber. **60,** 2122 **1927.**
46. von Braun, J., E. Danziger, and Z. Koehler, Ber. **50,** 56 **1917.**
47. von Braun, J., and A. Stuckenschmidt, Ber. **56,** 1724 **1923.**
48. Wagner-Jauregg, T., H. Arnold, and F. Hüter, Ber. **75,** 1293 **1942.**
49. Wagner-Jauregg, T., H. Arnold, F. Hüter, and J. Schmidt, Ber. **74,** 1522 **1941.**
50. Wagner-Jauregg, T., E. Friess, H. Hippchen, and F. Prier, Ber. **76,** 1157 **1943.**
51. Wagner-Jauregg, T., and H. Hippchen, Ber. **76,** 694 **1943.**
52. Weger, M., Z. angew. Chem. **22,** 338 **1909.**
53. Zelinskiĭ, N. D., and I. N. Tits, Ber. **62,** 2869 **1929.**

2. TETRAHYDRONAPHTHALENE AND ITS ALKYL DERIVATIVES, C_nH_{2n-8}

$C_{10}H_{12}$

1,2,3,4-Tetrahydronaphthalene
(Tetralin)



M. P., °C

−35.8
−30−−27[60]
−30[51, 52]
−31[33]
−35.0 ± 0.5[23]

−36.22(a)[38]
−36.3[12, 13]

B. P., °C @ 760mm

207.4
208[25, 33, 51, 73]
206–208[60]
205–208[6, 52, 57]
207.66[38]
207.6[54]
207.3[23]
207.1[23]
207.0[12]
207[14, 79]
206.6–207.0[18]
206.5–207.0[82]
206.5–207[37]
206–207[47]
205–207 (b)
206[10, 21, 34, 48, 61, 83]
204–206[30]
205.4–205.8[32]
205.7[62]
205 (c)
204–205[9, 44, 49, 81]

207.6	768.66[23]
206–207	764[70]
207	763[77]
206.8 ± 0.2	759[7]
206.5	755[60]
206.6	751.28[23]
206.2	740[23]
204–205	722[4]
204.0–204.5	716.3[82]
204.5–205	716[3]
205–207	708[2]
167.5	273[23]
150.0	162[23]
148.6	147.2[19]
140.0	118[23]
126.9	76.0[23]
126.6	67.8[19]
116.8	52.5[23]
105.2	36[75]
103.0	30[23]
100–101	25[60]
101.1	22.8[19]
96	21[64]
93.8	20[23]
90.8–91.2	17[65, 70]
89	12[26]
75.5	7.2[19]
75.1	7.1[19]
74.4	7.0[19]
71–72	6[41]
54.0	2.2[19]
52–55	2[46]
49.4	1.9[19]
48.9	1.9[19]
46.6	1.7[19]
65.0	0.83[35]
41.8	0.7[19]
40.8	0.7[19]
40.1	0.6[19]
39.3	0.5[19]
25.0	0.40[35]
20	0.263[50]
20	0.26[50]
−1.2	0.0235[35]
−2.4	0.015[35]

D_4^{20}

0.9702
0.966[34, 83]
0.9663[77]
0.9681[45]
0.9705[38]
0.9706[65]
0.9707[18]
0.971[66, 67, 71]
0.9712[82]
0.9714[77]
0.972[47, 63]
0.973[22, 31]

0.8496	179.6°[23]
0.851	170°[22]
0.8718	150.0°[23]
0.892	120°[22]
0.9072	100°[18]

0.9210	84.0° [23]	n_D^{20}	
0.924	80° [22]	1.5397[77]	
0.9257	78.45° [23]	1.5402[34, 40, 83]	
0.9272	75° [23]	1.54161[38]	
0.9396	60° [23]	1.5427[76]	
0.943	50° [15]	1.54282[82]	
0.9464	50° [23]	1.5429[65]	
0.9469	50° [18]	1.5430[47]	
0.949	50° [22]	1.5434[71]	
0.9567	36.7° [23]	1.5437[67]	
0.9638	27° [27]	1.5438[18]	
0.9652	25° [23]	1.5439[19]	
0.9659	25° [5]	1.5441[77]	
0.9665	25° [38]	1.5442[71]	
0.9666	25° [41]	1.54493[16]	
0.9675	25° [28, 30]	1.546[31]	
0.9678	25° [28]	1.54638[16]	
0.9658	24.7° [23]	1.54678[16]	
0.965	21.5° [15]	1.487	170° [22]
0.9694	21.4° [70]	1.507	120° [22]
0.9729	20.2° [31]	1.524	80° [22]
0.9735	D_{20}^{20} [24]	1.537	50° [22]
0.975	D_{20}^{20} [36]	1.5392	25° [28]
0.9732	18.0° [70]	1.53952	25° [38]
0.9734	17.8° [70]	1.5396	25° [28]
0.9738	17.6° [70]	1.5408	25° [30]
0.9718	17° [74]	1.5410	25° [41]
0.9737	17° [8]	1.54222	21.4° [70]
0.9731	15.1° [23]	1.54605	20.6° [31]
0.9698	15° [15]	1.54614	20.2° [31]
0.972	15° [57]	1.5443	19.9° [24]
0.974	15° [78]	1.54511	17.8° [70]
0.975	15° [43, 58, 59, 69]	1.54529	17.6° [70]
0.977	15° [53]	1.5468	17° [8]
0.9774	15° [68]	1.5465	15° [18]
0.9743	13.5° [23]	1.5481	15° [68]
0.97572	13.35° [49]	1.55200	13.35° [49]
0.9745	13.3° [23]	1.55312	11.9° [49]
0.97634	11.9° [49]		
0.9842	2° [23]	1.51140	$n_{H\alpha}^{78.1}$ [17]
0.9825	0° [56]	1.53496	$n_{H\alpha}^{25}$ [38]
0.984	0° [34]	1.53765	$n_{H\alpha}^{21.4}$ [70]
0.9866	0° [18]	1.54612	$n_{H\alpha}^{20.6}$ [31]
0.984	D_0^0 [83]	1.54181	$n_{H\alpha}^{20.2}$ [31]

1.53703	$n_{H\alpha}^{20}$ 38
1.54021	$n_{H\alpha}^{17.8}$ 70
1.54057	$n_{H\alpha}^{17.6}$ 70
1.54703	$n_{H\alpha}^{13.35}$ 49
1.54819	$n_{H\alpha}^{11.9}$ 49
1.52700	$n_{H\beta}^{78.1}$ 17
1.55097	$n_{H\beta}^{25}$ 38
1.55405	$n_{H\beta}^{21.4}$ 70
1.55853	$n_{H\beta}^{20.6}$ 31
1.55869	$n_{H\beta}^{20.2}$ 31
1.55326	$n_{H\beta}^{20}$ 38
1.55709	$n_{H\beta}^{17.8}$ 70
1.55734	$n_{H\beta}^{17.6}$ 70
1.56533	$n_{H\beta}^{13.35}$ 49
1.56656	$n_{H\beta}^{11.9}$ 49
1.53685	$n_{H\gamma}^{78.1}$ 17
1.56424	$n_{H\gamma}^{21.4}$ 70
1.56907	$n_{H\gamma}^{20.6}$ 31
1.56914	$n_{H\gamma}^{20.2}$ 31
1.56765	$n_{H\gamma}^{17.8}$ 70
1.56782	$n_{H\gamma}^{17.6}$ 70
1.57838	$n_{H\gamma}^{11.9}$ 49

Additional Data

$$\frac{dD}{dt} = -0.0007761$$

(0 to 50°C)

(a) This constant was given as a freezing point in the literature.

(b) The boiling point 205–207 is found in references 1, 29, 43, 50, 58, 59, 66, 68, 69, 76, 80.

(c) The boiling point 205 is found in references 11, 20, 39, 40, 42, 53, 56, 72.

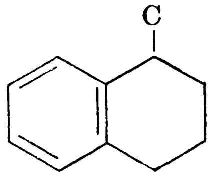
References on 1,2,3,4-Tetrahydronaphthalene

1. Bag, A., T. Egupov, and D. Volokitin, Ind. org. Chem. (U S.S.R.) **2,** 141 **1936;** Chem. Zentr. **1937,** I, 1273.
2. Bamberger, E., and F. Bordt, Ber. **22,** 625 **1889.**
3. Bamberger, E., and M. Kitschelt, Ber. **23,** 1561 **1890.**
4. Bamberger, E., and W. Lodter, Ann. **288,** 74 **1895.**
5. Berger, G., Z. physik. Chem. **28B,** 95 **1935.**
6. Berl, E., and H. Schildwächter, Brennstoff-Chem. **9,** 105 **1928.**
7. Bird, L. H., and E. F. Daly, Trans. Faraday Soc. **35,** 588 **1939.**
8. Boedtker, E., and O. Rambech, Bull. soc. chim. [4] **35,** 631 **1924.**
9. Boes, J., Ber. deut. pharm. Ges. **12,** 222 **1902.**
10. Bogert, M. T., and V. G. Fourman, J. Am. Chem. Soc. **55,** 4670 **1933.**
11. Booth, J. H. W., Klepzigs Text-Z. **41,** 314 **1938;** Chem. Zentr. **1938,** II, 2045.
12. de Carli, F., Atti accad. Lincei [6] **4,** 460 **1926.**
13. de Carli, F., Atti accad. Lincei [6] **4,** 523 **1926.**
14. Deutsch, P., Gas-u. Wasserfach **74,** 245 **1931.**
15. Doldi, S., Ann. chim. applicata **28,** 454 **1938.**
16. Eckart, H., Brennstoff-Chem. **4,** 24 **1923.**
17. Eisenlohr, F., Ber. **54,** 2857 **1923.**
18. Evans, E. B., J. Inst. Petroleum Tech. **24,** 537 **1938.**
19. Gardner, G. S., and J. E. Brewer, Ind. Eng. Chem. **29,** 179 **1937.**
20. Graebe, C., Ber. **5,** 677 **1872.**
21. Graebe, C., and P. A. Guye, Ber. **16,** 3028 **1883.**
22. Grodde, K.-H., Physik. Z. **39,** 772 **1938.**
23. Herz, W., and P. Schuftan, Z. physik. Chem. **101,** 269 **1922.**
24. Hofmann, F., K. Berlin, and A. W. Schmidt, Brennstoff-Chem. **14,** 326 **1933.**
25. Howard, L. B., and G. E. Hilbert, J. Am. Chem. Soc. **60,** 1918 **1938.**
26. Hückel, W., and H. Bretschneider, Ann. **540,** 157 **1939.**
27. Joglekar, M. S., Z. Physik **101,** 398 **1936.**
28. Kagehira, I., Bull. Chem. Soc. Japan **6,** 241 **1931.**
29. Kantorowicz, H., Seifenfabr. **40,** 129 **1920.**
30. Kimura, S., Mem. Coll. Sci., Kyoto Imp. Univ. **14,** 303 **1931.**

31. Krollpfeiffer, F., Ann. **430,** 161 **1923.**
32. Larsen, R. G., R. E. Thorpe, and F. A. Armfield, Ind. Eng. Chem., **34,** 183 **1942.**
33. Lebeau, P., and Picon, Compt. rend. **158,** 1514 **1914.**
34. Leroux, H., Compt. rend. **139,** 672 **1904.**
35. Linder, E. G., J. Phys. Chem. **35,** 531 **1931.**
36. Lovell, W. G., J. M. Campbell, F. K. Signaigo, and T. A. Boyd, Ind. Eng. Chem. **26,** 475 **1934.**
37. Maillard, A., Ann. combustibles liquides **9,** 1013 **1934.**
38. Mair, B. J., and A. J. Streiff, J. Research Natl. Bur. Standards **27,** 343 **1941.**
39. Mameli, E., and A. Mossini, Giorn. chim. ind. applicata **15,** 161 **1933.**
40. Martin, E., Ann. combustibles liquides **12,** 97 **1937.**
41. Matsuno, K., and K. Han, Bull. Chem. Soc. Japan **11,** 321 **1936.**
42. McVicker, W. H., J. K. Marsh, and A. W. Stewart, J. Chem. Soc. **125,** 1743 **1924.**
43. Meier, E., Farben-Ztg. **26,** 1765 **1921.**
44. Meyer, R., and H. Fricke, Ber. **47,** 2765 **1914.**
45. Müller, F. H., Physik. Z. **38,** 283 **1937.**
46. Musser, D. M., and H. Adkins, J. Am. Chem. Soc. **60,** 664 **1938.**
47. Nametkin, S. S., and L. M. Rosenberg, Bull. acad. sci. U.R.S.S. **1943,** No. 11-12, 3; Survey For. Petrol. Liter. T460, Aug. 18, **1944.**
48. Ogawa, T., and T. Yokota, Bull. Chem. Soc. Japan **5,** 266 **1930.**
49. Pellini, G., Gazz. chim. ital. **31,** I, 1 **1901.**
50. Piatti, L., Erdol u. Teer **5,** 421 **1929.**
51. Pohl, J., and M. Rawicz, Z. physiol. Chem. **104,** 95 **1919.**
52. Röckemann, W., Arch. exptl. Path. Pharmakol. **92,** 52 **1922.**
53. Ross, R., and J. P. Leather, Analyst **31,** 284 **1906.**
54. Rossini, F. D., Petroleum Engineer **14,** No. 5, 41 **1943.**
55. Roth, W. A., and K. von Auwers, Ann. **407,** 145 **1914.**
56. Sabatier, P., and J. B. Senderns, Compt. rend. **132,** 1254 **1901.**
57. Sachanen, A. N., [Sakhanin] and M. D. Tilicheev, Ber. **62,** 658 **1929.**
58. Schön, T., Oesterr. Chem.-Ztg. **23,** 69 **1920.**
59. Schrauth, W., and R. Heuter, Farben-Ztg. **25,** 535 **1919-1920.**
60. Schroeter, G., Ann. **426,** 1 **1922.**
61. Schroeter, G., Umschau **25,** 213 **1921.**
62. Schuster, F., Gas-u. Wasserfach **72,** 650 **1929.**
63. Spilker, A., and K. Zerbe, Z. angew. Chem. **39,** 1138 **1926.**
64. Straus, F., and L. Lemmel, Ber. **54,** 25 **1921.**
65. Straus through W. A. Roth and K. von Auwers, Ann. **407,** 145 **1914.**
66. Treibs, W., and H. Schmidt, Ber. **61,** 459 **1928.**
67. Turova-Pollak, M. B., and N. B. Lysibmova, J. Gen. Chem. (U.S.S.R.) **8,** 538 **1938;** C.A. **32,** 7909 **1938.**
68. Utz, Gummi-Ztg. **34,** 779 **1920;** C.A. **14,** 3002 **1920;** Chem. Zentr. **1920,** IV, 182.
69. Vollmann, Farben-Ztg. **24,** 1689 **1919;** C.A. **14,** 357 **1920.**
70. von Auwers, K., Ber. **46,** 2988 **1913.**
71. von Auwers through G. Schroeter, Ann. **426,** 1 **1922.**
72. von Braun, J., and H. Deutsch, Ber. **45,** 1267 **1912.**
73. von Braun, J., and A. Stuckenschmidt, Ber. **56,** 1724 **1923.**
74. Vorländer, D., and J. Fischer, Ber. **65,** 1756 **1932.**
75. Ward, J. J., W. R. Kirner, and H. C. Howard, J. Am. Chem. Soc. **67,** 246 **1945.**
76. Watermann, H. I., J. J. Leendertse, and J. B. Nieman, Rec. trav. chim. **56,** 59 **1937.**
77. Willstätter through W. A. Roth and K. von Auwers, Ann. **407,** 145 **1914.**
78. Weger, M., Ber. **36,** 309 **1903.**
79. Weissenberger, G., Gas-u. Wasserfach **73,** 819 **1930.**
80. Weissenberger, G., Gas-u. Wasserfach **74,** 154 **1931.**
81. Willstätter, R., and V. L. King, Ber. **46,** 527 **1913.**
82. Willstätter, R., and F. Seitz, Ber. **56,** 1388 **1923.**
83. Wischin, R., Chem. Ztg. **29,** 1126 **1905.**

$C_{11}H_{14}$

1-Methyl-1,2,3,4-tetrahydronaphthalene

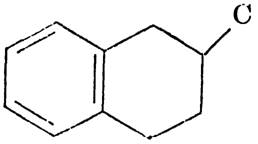


B. P., °C @ 760mm	
218–219[44]	
153–155	55[1]

D^{20}_4	
0.9536	25°[44]
0.9546	25°[44]
0.9547	25°[44]

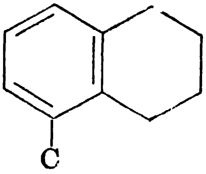
n^{20}_{D}	
1.53316	n^{25}_{He}[44]
1.53332	n^{25}_{He}[44]
1.53366	n^{25}_{He}[44]

2-Methyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm	
220–222[47]	
221[3]	
220[33]	
218–220[32]	
99–101	13[3]

5-Methyl-1,2,3,4-tetrahydronaphthalene



M. P., °C

−23.02 (a)[34]

B. P., °C @ 760mm	
234.4[45]	
234.35[34]	
184.98	217.2[34]
143.76	57.3[34]

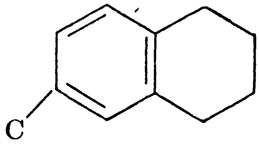
D^{20}_4	
0.9720[34]	
0.9682	25°[34]

n^{20}_{D}	
1.54395[34]	
1.54190	25°[34]
1.53738	$n^{25}_{\mathrm{H}\alpha}$[34]
1.53937	$n^{20}_{\mathrm{H}\alpha}$[34]
1.55325	$n^{25}_{\mathrm{H}\beta}$[34]
1.55536	$n^{20}_{\mathrm{H}\beta}$[34]

(a) This constant was given as a freezing point in the literature

---

6-Methyl-1,2,3,4-tetrahydronaphthalene



M. P., °C

−39.92 (a)[34]

B. P., °C @ 760mm	
229.03[34]	
229.0[45]	
224–226[27]	
179.91	217.2[34]
138.75	57.3[34]

D^{20}_4	
0.950[27]	
0.9537[34]	
0.9500	25°[34]
0.9541	15.1°[27]

n^{20}_{D}	
1.5328[21]	

1.535[27]	
1.53572[34]	
1.53365	25°[34]
1.53719	15.1°[27]
1.52920	$n_{H\alpha}^{25}$[34]
1.53115	$n_{H\alpha}^{20}$[34]
1.53316	$n_{H\alpha}^{15.1}$[27]
1.54498	$n_{H\beta}^{25}$[34]
1.54706	$n_{H\beta}^{20}$[34]
1.54907	$n_{H\beta}^{15.1}$[27]
1.55897	$n_{H\gamma}^{15.1}$[27]

(a) This constant was given as a freezing point in the literature.

---

x-Methyl-1,2,3,4-tetrahydronaphthalene (a)

B. P., °C @ 760mm

115–117	15[2]

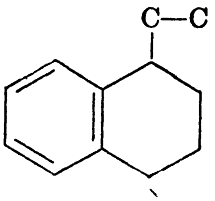
D_4^{20}

0.9368[43]

(a) The structure of this compound was not clearly defined in the literature.

$C_{12}H_{16}$

1-Ethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

237–238[44]	
241.5–243.5	739[39]

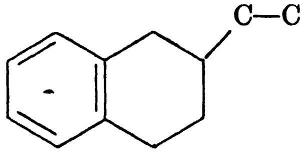
D_4^{20}

0.9529[39]	
0.9498	25°[44]
0.9511	25°[44]

n_D^{20}

1.5388[39]	
1.52992	n_{He}^{25}[44]
1.52999	n_{He}^{25}[44]

2-Ethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

237[31]	
235–235.5	731[30]
63–65	0.5[38]

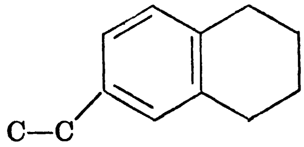
D_4^{20}

0.9401	15.5°[30]
0.9447	15°[31]
0.9515	D_0^0[30]
0.9542	D_0^0[31]

n_D^{20}

1.5250	15.5°[30]
1.5287	15°[31]

6-Ethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

245–246[27]	
239–239.5	736[30]
127	21[22]

D_4^{20}

0.948[27]	
0.9499	17.6°[27]
0.9608	15.5°[30]
0.9733	D_0^0[30]

n_D^{20}

1.534[27]	
1.53474	17.6°[27]

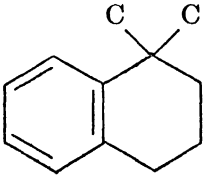
	1.5350	15.5° [30]
	1.53072	$n_{H\alpha}^{17.6}$ [27]
	1.54627	$n_{H\beta}^{17.6}$ [27]
	1.55594	$n_{H\gamma}^{17.6}$ [27]

x-Ethyl-1,2,3,4-tetrahydronaphthalene (a)

B. P., °C @ 760mm		
	244[5]	
	119–120	12[5]
	121–122	10[3]
D_4^{20}		
	0.9632	17° [5]
n_D^{20}		
	1.5414	16° [5]

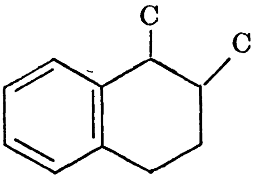
(a) The ethyl group may be in either the 2- or 6-position.

1,1-Dimethyl-1,2,3,4-tetrahydronaphthalene



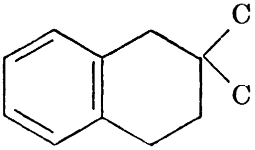
B. P., °C @ 760mm		
	220–222	761[8]
	98	10[8]
D_4^{20}		
	0.9474	25° [8]
n_D^{20}		
	1.52736	25° [8]

1,2-Dimethyl-1,2,3,4-tetrahydronaphthalene



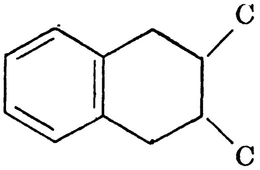
B. P., °C @ 760mm		
	235[44]	
	123.5–124.5	11[50]
D_4^{20}		
	0.988[50]	
	0.9433	25° [44]
	0.9841	23.8° [50]
	0.9847	23.5° [50]
n_D^{20}		
	1.5593[50]	
	1.55762	23.8° [50]
	1.55298	$n_{H\alpha}^{23.8}$ [50]
	1.57082	$n_{H\beta}^{23.8}$ [50]
	1.58195	$n_{H\gamma}^{23.8}$ [50]
	1.52652	n_{He}^{25} [44]

2,2-Dimethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm		
	123	34[48]
	104	12[15]
D_4^{20}		
	0.92483	24.1° [48]
n_D^{20}		
	1.51850	24.1° [48]

2,3-Dimethyl-1,2,3,4-tetrahydronaphthalene



M. P., °C

4–8 (a)[17]

−8−−5 (a)[17]

B. P., °C @ 760mm

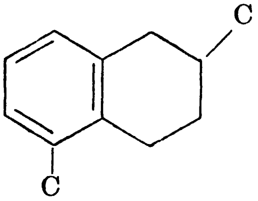
229–231 (a)[17]

227[32, 33]

222–224 (a)[17]

(a) These constants were determined on isomeric forms.

2,5-Dimethyl-1,2,3,4-tetrahydronaphthalene



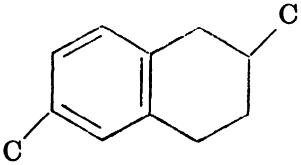
B. P., °C @ 760mm

115	14[26]
110–111	10[35]

D_4^{20}

0.9487	16° [35]

2,6-Dimethyl-1,2,3,4-tetrahydronaphthalene



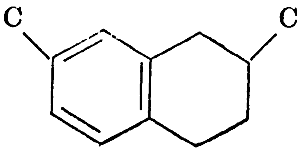
M. P., °C

14–17[16]

B. P., °C @ 760mm

237–239[16]

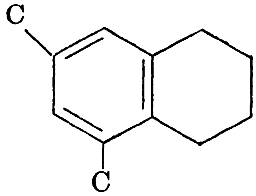
2,7-Dimethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

237–238[16]

5,7-Dimethyl-1,2,3,4-tetrahydronaphthalene (a)



B. P., °C @ 760mm

250–252[27]

D_4^{20}

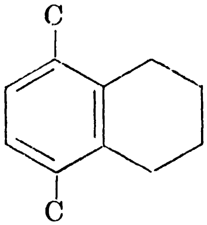
0.960[27]	
0.9589	21.0° [27]

n_D^{20}

1.541[27]	
1.54094	21.0° [27]
1.53683	$n_{II\alpha}^{21.0}$ [27]
1.55287	$n_{II\beta}^{21.0}$ [27]
1.56297	$n_{II\gamma}^{21.0}$ [27]

(a) The structure of this compound was not clearly defined in the literature.

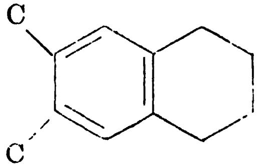
5,8-Dimethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

254[4]	
120	1[4]

6,7-Dimethyl-1,2,3,4-tetrahydronaphthalene



M. P., °C

10[17]

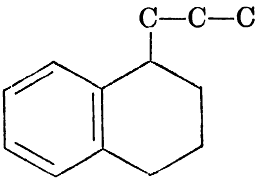
B. P., °C @ 760mm

244–246[17]

128 7[4]

$C_{13}H_{18}$

1-*n*-Propyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

253[44]

256–258 759[39]

D_4^{20}

0 9395[39]

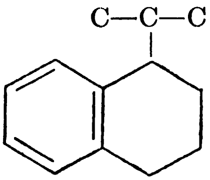
0.9415 25°[44]

n_D^{20}

1.5308[39]

1.52496 n_{He}^{25}[44]

1-Isopropyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

247[44]

D_4^{20}

0.9450 25°[44]

n_D^{20}

1.52705 n_{He}^{25}[44]

---

x-Isopropyl-1,2,3,4-tetrahydronaphthalene (a)

B. P., °C @ 760mm

124–126 13[3]

127 7[5]

D_4^{20}

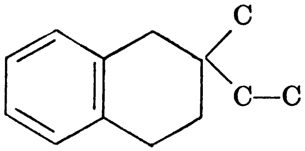
0.9518 16°[5]

n_D^{20}

1.5352 16°[5]

(a) The isopropyl group may be in either the 2- or 6-position.

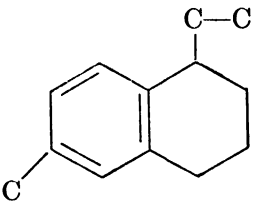
2-Methyl-2-ethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

118 20[15]

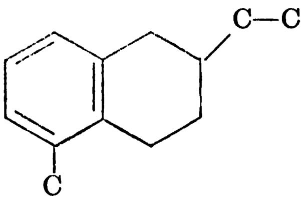
1-Ethyl-6-methyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

126 10[11]

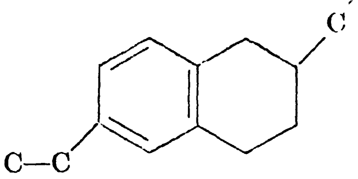
2-Ethyl-5-methyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

130 16[23]

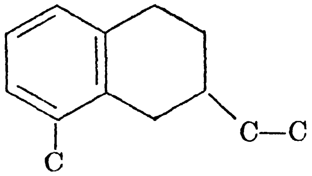
2-Methyl-6-ethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

140–145	10[12]

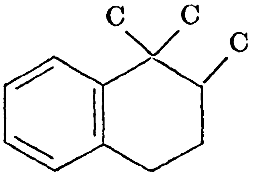
3-Ethyl-5-methyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

129–131	14[23]

1,1,2-Trimethyl-1,2,3,4-tetrahydronaphthalene



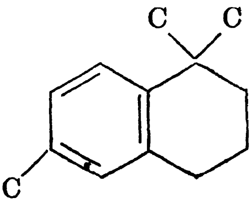
B. P., °C @ 760mm

241–242	760.7[42]

n_D^{20}

1.5270	25°[42]

1,1,6-Trimethyl-1,2,3,4-tetrahydronaphthalene
(Ionene)



B. P., °C @ 760mm

240–242	752[9]
238–239	730[37]
130	30[14]
114	14[9]
107	10[9]
88–91	4[8]

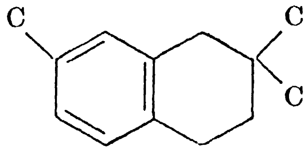
D_4^{20}

0.9303[9]	
0.9331[9]	
0.9356[37]	
0.9320	25°[8]

n_D^{20}

1.5225[9]	
1.5257[37]	
1.52167	25°[8]

2,2,7-Trimethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

128	23[48]

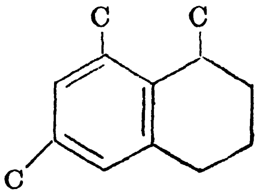
D_4^{20}

0.91747	24.5°[48]

n_D^{20}

1.51635	24.5°[48]

1,6,8-Trimethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

133–136	18.5[24]

$C_{14}H_{20}$

x-*n*-Butyl-1,2,3,4-tetrahydronaphthalene (a)

B. P., °C @ 760mm

272–273	750^{39}
269–270	750^{39}

D_4^{20}

0.9312^{39}
0.9331^{39}

n_D^{20}

1.5258^{39}
1.5271^{39}

(a) The structure of this compound was not clearly defined in the literature.

x-*sec*-Butyl-1,2,3,4-tetrahydronaphthalene (a)

B. P., °C @ 760mm

268–270	759^{39}

D_4^{20}

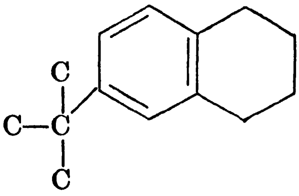
0.9356^{39}

n_D^{20}

1.5255^{39}

(a) The structure of this compound was not clearly defined in the literature.

6-*tert*-Butyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

262–264	752^{10}
138–140	18^{10}
135–136	16^{10}

x-*tert*-Butyl-1,2,3,4-tetrahydronaphthalene (a)

B. P., °C @ 760mm

265–267	746^{39}
129	11^{3}

D_4^{20}

0.9349^{39}

n_D^{20}

1.5292^{39}

(a) The structure of this compound was not clearly defined in the literature.

x-Butyl-1,2,3,4-tetrahydronaphthalene (a)

B. P., °C @ 760mm

265 5–266.5^{5}	
138	9^{5}

D_4^{20}

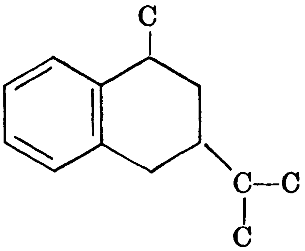
0.9463	15° ^{5}

n_D^{20}

1.5348	15° ^{5}

(a) The butyl group may be in either the 2- or 6-position.

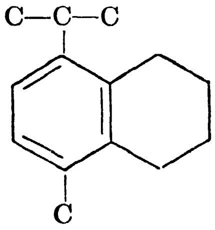
1-Methyl-3-isopropyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

138–139	16^{18}

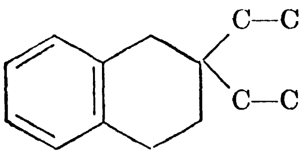
5-Methyl-8-isopropyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

135–140 12^{46}

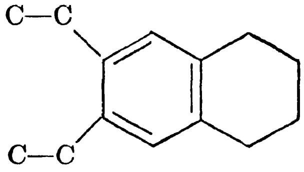
2,2-Diethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

110 4^{48}

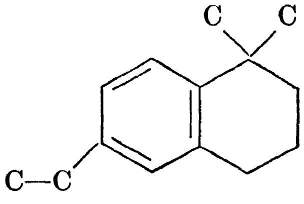
6,7-Diethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

150–151 18^{22}

1,1-Dimethyl-6-ethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

104–105 4^{41}

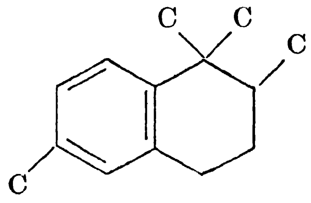
D_4^{20}

0.9304 25°^{41}

n_D^{20}

1.5220 25°^{41}

1,1,2,6-Tetramethyl-1,2,3,4-tetrahydronaphthalene (Irene)



B. P., °C @ 760mm

120–125 $10^{6,7}$

D_4^{20}

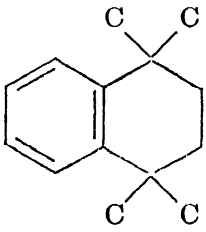
0.9379 25°^{6}

n_D^{20}

1.511^{7}

1.5261 25°^{6}

1,1,4,4-Tetramethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

248^{13}

82–84 3^{13}

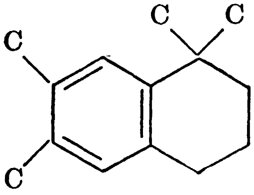
D_4^{20}

0.9482 27°^{13}

n_D^{20}

1.5278 27°^{13}

1,1,6,7-Tetramethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm		
	103–104	4^{41}
D_4^{20}		
	0.9392	25° ^{41}
n_D^{20}		
	1.5280	25° ^{41}

$C_{15}H_{22}$

x-Pentyl-1,2,3,4-tetrahydronaphthalene (a)

B. P., °C @ 760mm		
	147–150	12^{5}
D_4^{20}		
	0.9478	17° ^{5}
n_D^{20}		
	1.5332	17° ^{5}

(a) The pentyl group may be in either the 2- or 6-position.

$C_{16}H_{24}$

x-Hexyl-1,2,3,4-tetrahydronaphthalene (a)

B. P., °C @ 760mm		
	120.5–122	0.8^{40}
D_4^{20}		
	0.9203^{40}	
n_D^{20}		
	1.5171^{40}	

(a) The structure of this compound was not clearly defined in the literature.

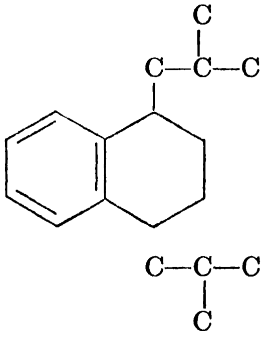
$C_{18}H_{28}$

x-*n*-Octyl-1,2,3,4-tetrahydronaphthalene (a)

B. P., °C @ 760mm		
	324–326	740^{39}
D_4^{20}	0.9132^{39}	
n_D^{20}	1.5138^{39}	

(a) The structure of this compound was not clearly defined in the literature.

1,4-Diisobutyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm		
	170–175	16^{25}
D_4^{20}	0.8619	100° ^{19}
	0.8939	50° ^{19}
	0.9137	19° $^{25,\ 29}$
	0.9194	10° ^{25}
	0.9259	0° ^{19}
n_D^{20}	1.5184	18° $^{25,\ 29}$

$C_{22}H_{36}$

x,x-Dihexyl-1,2,3,4-tetrahydronaphthalene (a)

M. P., °C		
	-36^{40}	
B. P., °C @ 760mm		
	182–184	1.5^{40}

D_4^{20}

0.9303[40]	
0.9358	D_{15}^{15} [40]

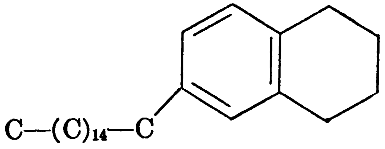
n_D^{20}

1.5220[40]

(a) The structure of this compound was not clearly defined in the literature.

$C_{26}H_{44}$

6-*n*-Hexadecyl-1,2,3,4-tetrahydronaphthalene

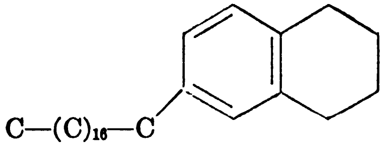


B. P., °C @ 760mm

210–215	1[20]

$C_{28}H_{48}$

6-*n*-Octadecyl-1,2,3,4-tetrahydronaphthalene



M. P., °C

32.5–33[28]
29–30[36]

D_4^{20}

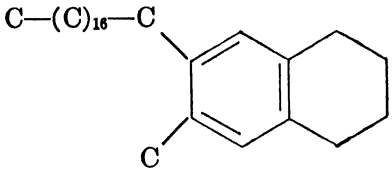
0.8656	55° [28]
0.8722	45° [28]

n_D^{20}

1.48656	55° [28]
1.48280	$n_{H\alpha}^{55}$ [28]
1.49371	$n_{H\beta}^{55}$ [28]

$C_{29}H_{50}$

6-Methyl-7-*n*-octadecyl-1,2,3,4-tetrahydronaphthalene

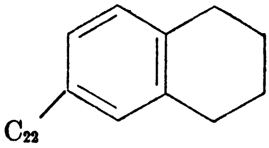


M. P., °C

60–61[20]

$C_{32}H_{56}$

6-Docosyl-1,2,3,4-tetrahydronaphthalene



M. P., °C

43–45[36]

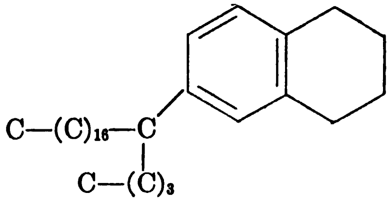
D_4^{20}

0.8786	25° [36]

n_D^{20}

1.4969	25° [36]

6-(5′-Docosyl)-1,2,3,4-tetrahydronaphthalene



D_4^{20}

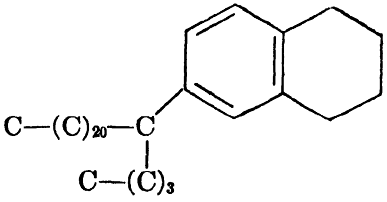
0.881	25° [36]

n_D^{20}

1.4723	80° [49]
1.4932	25° [36, 49]

$C_{36}H_{64}$

6-(5′-Hexacosyl)-1,2,3,4-tetrahydronaphthalene



M. P., °C

35[36]

D_4^{20}

0.8762 25° [36]

n_D^{20}

1.4940 25° [36]

References on $C_{11}H_{14}$ through $C_{36}H_{64}$ Compounds

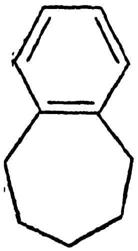
1. Arbusov, B. A., and E. V. Kuznetsov, Compt. rend. acad. sci. U.R.S.S. **39,** 343 **1943;** Survey For. Petrol. Liter. Feb. 25, **1944.**
2. Arnold, R. T., and R. Banes, J. Am. Chem. Soc. **65,** 2393 **1943.**
3. Barbot, A., Bull. soc. chim. [4] **47,** 1314 **1930.**
4. Barnett, E. deB., and F. G. Sanders, J. Chem. Soc. **1933,** 434.
5. Boedtker, E., and O. Rambeck, Bull. soc. chim. [4] **35,** 631 **1924.**
6. Bogert, M. T., and P. M. Apfelbaum, J. Am. Chem. Soc. **60,** 930 **1938.**
7. Bogert, M. T., and P. M. Apfelbaum, Science [2] **79,** 280 **1934.**
8. Bogert, M. T., D. Davidson, and P. M. Apfelbaum, J. Am. Chem. Soc. **56,** 959 **1934.**
9. Bogert, M. T., and V. G. Fourman, J. Am. Chem. Soc. **55,** 4670 **1933.**
10. Bromby, N. G., A. T. Peters, and F. M. Rowe, J. Chem. Soc. **1943,** 144.
11. Brunner, O., and F. Grof, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **142,** Abt. IIb, 682 **1933.**
12. Brunner, O., and F. Grof, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **144,** Abt. IIb, 565 **1935.**
13. Bruson, H. A., and J. W. Kroeger, J. Am. Chem. Soc. **62,** 36 **1940.**
14. Clemo, G. R., and H. G. Dickenson, J. Chem. Soc. **1935,** 735.
15. Clemo, G. R., and H. G. Dickenson, J. Chem. Soc. **1937,** 255.
16. Coulson, E. A., J. Chem. Soc. **1935,** 77.
17. Coulson, E. A., J. Chem. Soc. **1938,** 1305.
18. Darzens, G., and A. Levy, Compt. rend. **201,** 152 **1935.**
19. Evans, E. B., J. Inst. Petroleum Tech. **24,** 537 **1938.**
20. Fieser, L. F., and J. Cason, J. Am. Chem. Soc. **62,** 432 **1940.**
21. Fieser, L. F., and R. N. Jones, J. Am. Chem. Soc. **60,** 1940 **1938.**
22. Fleischer, K., and F. Siebert, Ber. **53,** 1255 **1920.**
23. Harvey, J., I. M. Heilbron, and D. G. Wilkinson, J. Chem. Soc. **1930,** 423.
24. Heilbron, I. M., and D. G. Wilkinson, J. Chem. Soc. **1930,** 2537.
25. Hugel, G., and M. Lerer, Compt. rend. **195,** 249 **1932.**
26. Kipping, F. B., and F. Wild, J. Chem. Soc. **1940,** 1239.
27. Krollpfeiffer, F., and W. Schäfer, Ber. **56,** 620 **1923.**
28. Larsen, R. G., R. E. Thorpe, and F. A. Armfield, Ind. Eng. Chem. **34,** 183 **1942.**
29. Lerer, M., Ann. combustibles liquides **8,** 681 **1933.**
30. Levy, G., Ann. chim. [11] **9,** 5 **1938.**
31. Levy, G., Compt. rend. **192,** 1397 **1931.**
32. Madinaveitia, J., Anales soc. españ. fís. quím. **32,** 1100 **1934;** Chem. Zentr. **1935,** I, 3134.
33. Madinaveitia, J., Rev. acad. cienc. Madrid **31,** 617 **1934;** C.A. **29,** 5438 **1935.**
34. Mair, B. J., and A. J. Streiff, J. Research Natl. Bur. Standards **27,** 343 **1941.**
35. Mayer, F., and T. Schulte, Ber. **55,** 2164 **1922.**
36. Mikeska, L. A., Ind. Eng. Chem. **28,** 970 **1936.**
37. Müller, A., J. prakt. Chem. [2] **151,** 249 **1938.**

38. Musser, D. M., and H. Adkins, J. Am. Chem. Soc. **60, 664 1938.**
39. Petrov, A. D., and D. N. Andreev, J. Gen. Chem. (U.S.S.R.) **12,** 95 **1942.**
40. Pokrovskaya, E. S., and R. Y. Sushchik, J. Gen. Chem. (U.S.S.R.) **11,** 170 **1941;** C.A. **35,** 7388 **1941.**
41. Pope, G. W., and M. T. Bogert, J. Org. Chem. **2,** 276 **1937-1938.**
42. Price, D., D. Davidson, and M. T. Bogert, J. Org. Chem. **2,** 540 **1937-1938.**
43. Prokopets, E. I., J. Applied Chem. (U.S.S.R.) **10,** 126 **1937;** Chem. Zentr. **1937,** II, 1202.
44. Roblin, R., Jr., D. Davidson, and M. T. Bogert, J. Am. Chem. Soc. **57,** 151 **1935.**
45. Rossini, F. D., Petroleum Engineer **14,** No. 5, 41 **1943.**
46. Ruzicka, L., and M. Mingazzini, Helv. Chim. Acta **5,** 710 **1922.**
47. Schroeter, G., Ber. **54,** 2242 **1921.**
48. Sengupta, S. C., J. prakt. Chem. [2] **151,** 82 **1938.**
49. Willingham, C. B., J. Research Natl. Bur. Standards **22,** 321 **1937.**
50. Ziegler, K., and P. Tiemann, Ber. **55,** 3406 **1922.**

3. HIGHER BENZOCYCLANES, C_nH_{2n-8}

$C_{11}H_{14}$

Benzocycloheptane
(Benzosuberane)



B. P., °C @ 760mm

217	764[1, 4]

D_4^{20}

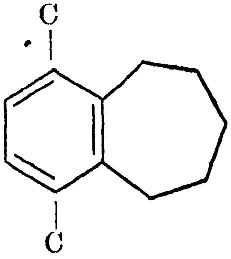
0.9693	19° [4]
0.9683	16.2° [2]

n_D^{20}

1.5458	19° [4]
1.54364	$n_{\mathrm{H}\alpha}^{16.2}$ [2]
1.56040	$n_{\mathrm{H}\beta}^{16.2}$ [2]
1.57108	$n_{\mathrm{H}\gamma}^{16.2}$ [2]
1.54856	$n_{\mathrm{He}}^{16.2}$ [2]

$C_{13}H_{18}$

2,3-Cycloheptano-1,4-dimethylbenzene



B. P., °C @ 760mm

122	13[3]

D_4^{20}

0.9621	20.5° [3]

n_D^{20}

1.5344	20.5° [3]

References on Higher Benzocyclanes

1. Borsche, W., and A. Roth, Ber. **54, 174 1921.**
2. von Auwers, K., Ber. **60,** 2122 **1927.**
3. von Braun, J., and M. Kühn, Ber. **60,** 2557 **1927.**
4. von Braun, J., and A. Stuckenschmidt, Ber. **56,** 1724 **1923.**

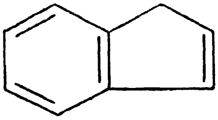
II. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-10}

1. Indene and Its Alkyl Derivatives
2. Indane with One Alkenyl or One Alkylidene Substitution
3. Dihydronaphthalene and Its Alkyl Derivatives
4. Tetrahydronaphthalene Derivatives of Empirical Formula C_nH_{2n-10}
5. Cyclopentanotetrahydronaphthalenes and Their Alkyl Derivatives
6. Octahydroanthracenes and Their Alkyl Derivatives
7. Octahydrophenanthrenes and Their Alkyl Derivatives
8. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-10}

1. INDENE AND ITS ALKYL DERIVATIVES, C_nH_{2n-10}

C_9H_8

Indene



M. P., °C

−1.50 (a)[38]
−1.67[8]
−1.76[14]
−2[39, 40]

B. P., °C @ 760mm

181
181–183[1, 11]
182.4[20]
181.8–182.3[9]
182.2[36]
182[23, 50]
181–182[58]
181–181.5[52]
181.0[29]
181 (b)
179.5–180.5[29, 30]
179.0–180.4[26]
180.0[29]
179.5–180[56]
179.5[28]
178.5–179.5[30]
179[27, 40]

180.5–181	764[30]
182.2–182.4	761[39]
179.5–180.5	757[17]
182.1–182.7	756.4[6]
181–181.3	749.6[13]
83.8	30.5[8]
76	25[31]
68	15[44]
70.8	12[16]
62	10[25]
55.0–55.5	6.5[12]
35–37	2[51]

D_4^{20}

0.9915[40]
0.992[44]
0.9968[9]
1.000[1]

0.9232	100° [9]
0.9692	50° [9]
0.984	25° [6]
0.9906	D_{25}^{25} [29, 30]
1.0121	D_{25}^{25} [29]
0.9925	D_{20}^{20} [29]
0.9934	D_{20}^{20} [30]
1.006	D_{20}^{20} [21]
1.0152	D_{20}^{20} [29, 30]
0.9975	18° [40]
1.008	15° [50]
1.040	15° [17]
0.9970	D_{15}^{15} [30]
0.9971	D_{15}^{15} [29]
1.0002	D_{15}^{15} [39]
1.0187	D_{15}^{15} [29, 30]
1.01995	12.7° [29]
1.0001	12° [12]
1.0008	D_{10}^{10} [29, 30]
1.0225	D_{10}^{10} [29, 30]
1.00227	8.2° [29]
1.0060	8° [40]
1.0050	D_5^5 [29]
1.0268	D_5^5 [29]
1.0059	4° [29, 30]
1.0081	4° [13]
1.0277	4° [29, 30]
1.0152	0° [9]

n_D^{20}

1.5642[1]

1.575[44]	
1.5764[38]	
1.5768[9]	
1.5755	25° [25]
1.5743	22° [57]
1.5769	22° [58]
1.5767	19.8° [8]
1.5770	19° [19]
1.5773	18.5° [39]
1.5763	17.6° [16]
1.5738_7	16.1° [7]
1.57980	15.3° [30]
1.5790	15° [9]
1.5804	10° [12]
1.57980	8.2° [29]
1.56940	$n^{20}_{H\alpha}$ [40]
1.5675_4	$n^{16.1}_{H\alpha}$ [7]
1.56454	$n^{15.6}_{H\alpha}$ [30]
1.57354	$n^{15.3}_{H\alpha}$ [30]
1.56454	$n^{12.7}_{H\alpha}$ [29]
1.57354	$n^{8.2}_{H\alpha}$ [29]
1.5903_9	$n^{16.1}_{H\beta}$ [7]
1.58743	$n^{15.6}_{H\beta}$ [30]
1.59693	$n^{15.3}_{H\beta}$ [30]
1.58743	$n^{12.7}_{H\beta}$ [29]
1.59693	$n^{8.2}_{H\beta}$ [29]
1.60220	$n^{15.6}_{H\gamma}$ [30]
1.61219	$n^{15.3}_{H\gamma}$ [30]
1.60220	$n^{12.7}_{H\gamma}$ [29]
1.61219	$n^{8.2}_{H\gamma}$ [29]

(c)

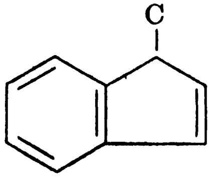
(a) This constant was given as a freezing point in the literature.

(b) The boiling point 181 is found in references 5, 10, 14, 19, 22, 29, 30, 57.

(c) Refractive indices at other lines are found in references 29, 30.

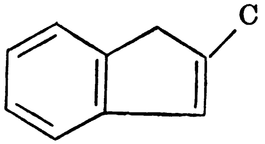
$C_{10}H_{10}$

1-Methylindene



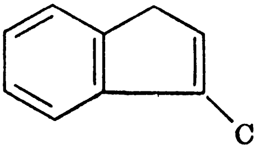
B. P., °C @ 760mm		
	198–202[43]	
	197–200[24]	
	198.5[54]	
	70	10[35]
D^{20}_4	0.9640[54]	
	0.9708	25° [35]
n^{20}_D	1.5595	25° [35]

2-Methylindene



B. P., °C @ 760mm		
	184–185	741[47]
	97–99	24[15]
	96–97	24[15]
	94–96	24[15]
	62–65	20[47]
	79	10[35]
D^{20}_4	0.9734	19° [35]
	0.9897	14° [47]
n^{20}_D	1.5645	23° [15]
	1.5646	23° [15]
	1.5650	19° [35]
	1.57574	14° [47]

3-Methylindene



B. P., °C @ 760mm

205–206[2, 3, 33, 34, 41]	
91–92	24[15]
86	15[44]
81–83	14[15]
77–81	14[15]
81	13[32]

D_4^{20}

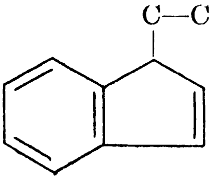
0.975[44]	
0.9682	27° [3]

n_D^{20}

1.562[44]	
1.5535	27° [15]
1.5590	27° [15]
1.55907	27° [3]
1.5598	23° [15]
1.55319	$n_{H\alpha}^{27}$ [3]
1.57460	$n_{H\beta}^{27}$ [3]
1.58865	$n_{H\gamma}^{27}$ [3]

$C_{11}H_{12}$

1-Ethylindene



B. P., °C @ 760mm

226[45]	
215–216[54]	
116	18[54]
92	12[35]

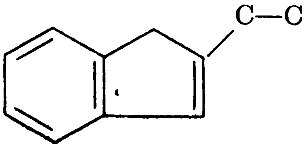
D_4^{20}

0.9645	22° [35]
0.9732	22° [45]

n_D^{20}

1.5543	22° [35]

2-Ethylindene



B. P., °C @ 760mm

96	11[35]

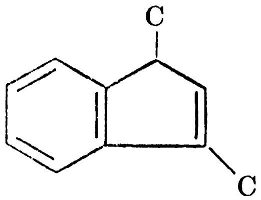
D_4^{20}

0.9619	22° [35]

n_D^{20}

1.5525	22° [35]

1,3-Dimethylindene



B. P., °C @ 760mm

212–214[46]	
86–88	11[46]

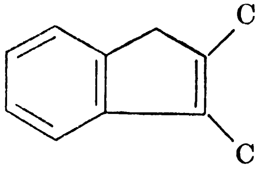
D_4^{20}

0.9553[46]

n_D^{20}

1.53444[46]

2,3-Dimethylindene



M. P., °C

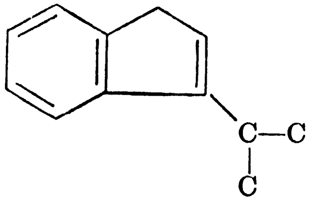
11[41]

B. P., °C @ 760mm

111.5–112.5	19[41]

$C_{12}H_{14}$

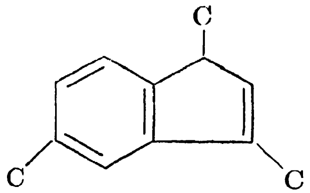
3-Isopropylindene



B. P., °C @ 760mm

113	15[42]

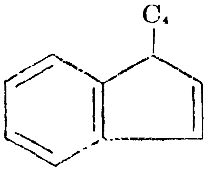
1,3,5-Trimethylindene



B. P., °C @ 760mm
103–104 14[49]
n_D^{20}
1.5478[49]

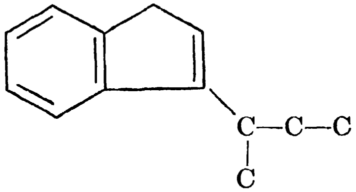
$C_{13}H_{16}$

1-Butylindene



B. P., °C @ 760mm
252–255[45]
120 10[45]
D_4^{20}
0.9552 23° [45]

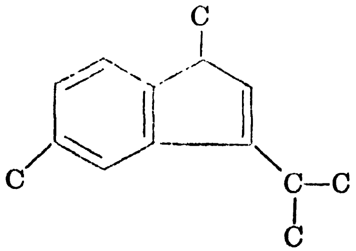
3-*sec*-Butylindene



B. P., °C @ 760mm
116–118 12[55]

$C_{14}H_{18}$

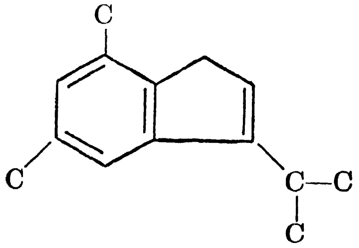
1,5-Dimethyl-3-isopropylindene (a)



B. P., °C @ 760mm
115–120 11[49]
D_4^{20}
1.5395 21° [49]

(a) The above formula was given for this compound, but the name given in the literature was "1-Isopropyl-3,6-dimethylindene."

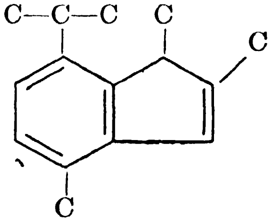
3-Isopropyl-5,7-dimethylindene



B. P., °C @ 760mm
125–130 0.2[48]
n_D^{20}
1.5426 18.5° [48]

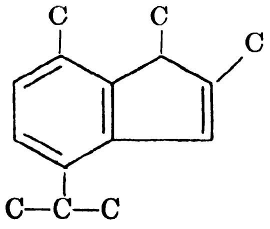
$C_{15}H_{20}$

1,2,4-Trimethyl-7-isopropylindene



M. P., °C
99.5[53]
B. P., °C @ 760mm
140–145 10[53]

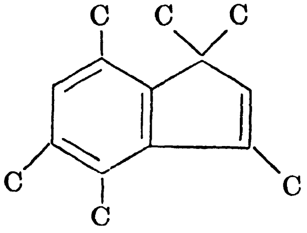
1,2,7-Trimethyl-4-isopropylindene



B. P., °C @ 760mm

154–157	17[4]
D_4^{20}	
0.9574	D_{25}^{25} [4]
n_D^{20}	
1.5428	25° [4]

1,1,3,4,5,7-Hexamethylindene



M. P., °C

87.5–88.5[37]

References on Indene and Its Alkyl Derivatives

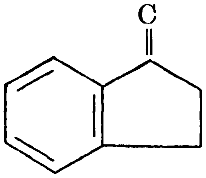
1. Brown, R. L., Ind. Eng. Chem. **17**, 920 **1925**.
2. Brühl, J. W., Ber. **25**, 142 **1892**.
3. Brühl, J. W., Ber. **25**, 151 **1892**.
4. Carter, C. L., and S. N. Slater, J. Chem. Soc. **1938**, 546.
5. Charlampowicz, B., and L. Marchlewski, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1930A**, 376; C.A. **25**, 5096 **1931**; Chem. Zentr. **1931**, I, 425.
6. Cortese, F., Rec. trav. chim. **48**, 564 **1929**.
7. Cotton, A., and H. Mouton, Ann. chim. phys. [8] **28**, 209 **1913**.
8. Dolliver, M. A., T. L. Gresham, G. B. Kistiakowsky, and W. E. Vaughan, J. Am. Chem. Soc. **59**, 831 **1937**.
9. Evans, E. B., J. Inst. Petroleum Tech. **24**, 537 **1938**.
10. Fichter, F., and H. Stenzl, Helv. Chim. Acta **22**, 425 **1939**.
11. Hall, C. C., J. Soc. Chem. Ind. **54**, 208 **1935–1936**.
12. Hayashi, T., Sci. Papers Inst. Phys. Chem. Res. (Tokyo) **23**, 274 **1934**.
13. Kipping, F. S., and H. Hall, J. Chem. Soc. **77**, 467 **1900**.
14. Klatt, W., Z. physik. Chem. **171A**, 454 **1934**.
15. Koelsch, C. F., and P. R. Johnson, J. Am. Chem. Soc. **65**, 567 **1943**.
16. Kohlrausch, K. W. F., and R. Seka, Ber. **71**, 1551 **1938**.
17. Krämer, G., and A. Spilker, Ber. **23**, 3276 **1890**.
18. Kraemer, G., and A. Spilker, Muspratt's "Encyclopädischen Handbuch der technischen Chemie" 4, Aufl. Bd. VIII, Braunschweig, **1905**.
19. Krassilshik, A., Ann. combustibles liquides **10**, 923 **1935**.
20. Lecat, M., Ann. soc. sci. Bruxelles **47B**, I, 108 **1927**.
21. Lovell, W. G., J. M. Campbell, F. K. Signaigo, and T. A. Boyd, Ind. Eng. Chem. **26**, 475 **1934**.
22. Mameli, E., Gazz. chim. ital. **67**, 669 **1937**.
23. Mameli, E., and A. Mossini, Giorn. chim. ind. applicata **15**, 161 **1933**.
24. Marckwald, W., Ber. **33**, 1504 **1900**.
25. Matsuno, K., and K. Han, Bull. Chem. Soc. Japan **11**, 321 **1936**.
26. McVicker, W. H, J. K. Marsh, and A. W. Stewart, J. Chem. Soc. **125**, 1743 **1924**.
27. Melamid, M, and E. Rosenthal, Z. angew. Chem. **36**, 333 **1923**.
28. Meyer, R., and W. Meyer, Ber. **51**, 1571 **1918**.
29. Perkin, W. H, J. Chem. Soc. **69**, 1025 **1896**.
30. Perkin, W. H., Jr., and G. Rivay, J. Chem. Soc. **65**, 228 **1894**.
31. Ramart-Lucas, and J. Hoch, Bull. soc. chim. [5] **2**, 327 **1935**.
32. Ramart-Lucas, and J. Hoch, Bull. soc. chim. [5] **5**, 848 **1938**.
33. Roser, W., Ann. **247**, 129 **1888**.
34. Roser, W., Ann. **247**, 157 **1888**.
35. Ruzicka, L., and E. Peyer, Helv. Chim. Acta **18**, 676 **1935**.
36. Schwarz, R., D. Pflugmacher, and M. Ruhnke, J. prakt. Chem. [2] **161**, 137 **1942**.
37. Smith, L. I., and W. W. Prichard, J. Am. Chem. Soc. **62**, 771 **1940**.
38. Smoker, E. H., and P. E. Burchfield, Ind. Eng. Chem. Anal. Ed., **15**, 128 **1943**.

39. Spilker, A., and A. Dombrowsky, Ber. **42,** 572 **1909.**
40. Stobbe, H., and E. Farber, Ber. **57,** 1838 **1924.**
41. Stoermer, R., and E. Laage, Ber. **50,** 981 **1917.**
42. Thiele, J., and K. Merck, Ann. **415,** 257 **1918.**
43. Thiele, J., and M. Rudiger, Ann. **347,** 275 **1906.**
44. von Auwers, K., Ann. **415,** 98 **1918.**
45. von Braun, J., Ber. **50,** 1658 **1917.**
46. von Braun, J., and G. Kirschbaum, Ber. **46,** 3041 **1913.**
47. von Braun, J., O. Kruber, and E. Danziger, Ber. **49,** 2642 **1916.**
48. Wagner-Jauregg, T., H. Arnold, and F. Hüter, Ber. **75,** 1293 **1942.**
49. Wagner-Jauregg, T., and H. Hippchen, Ber. **76,** 694 **1943.**
50. Weger, M., Z. angew. Chem. **22,** 338 **1909.**
51. Whitby, G. S., and M. Katz, Can. J. Research **4,** 344 **1931.**
52. Whitby, G. S., and M. Katz, J. Am. Chem. Soc. **50,** 1160 **1928.**
53. Whittleston, W. G., J. Am. Chem. Soc. **59,** 825 **1937.**
54. Wislicenus, W., and W. Hentrich, Ann. **436,** 9 **1924.**
55. Wuest, H.-M., Ann. **415,** 291 **1918.**
56. Zelinskiĭ, N. D., and P. Borissov, Ber. **57,** 2060 **1924.**
57. Zelinskiĭ, N. D., and M. B. Turova-Polyak, Ber. **62,** 1658 **1929.**
58. Zelinskiĭ, N. D., and M. B. Turova-Polyak, Ber. **62,** 2865 **1929.**

2. INDANE WITH ONE ALKENYL OR ONE ALKYLIDENE SUBSTITUTION, C_nH_{2n-10}

$C_{10}H_{10}$

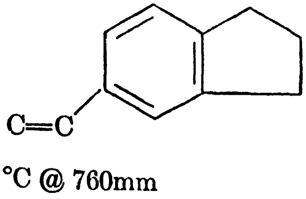
1-Methyleneindane
(Dihydrobenzofulvene)



B. P., °C @ 760mm
91–93 17^2

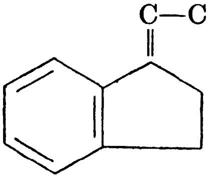
$C_{11}H_{12}$

5-Ethenylindane



B. P., °C @ 760mm
95–100 10^1

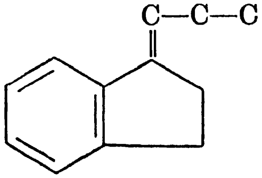
1-Ethylideneindane



B. P., °C @ 760mm
103–105 17^2

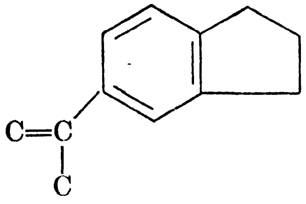
$C_{12}H_{14}$

1-Propylideneindane



B. P., °C @ 760mm
113–115 17^2

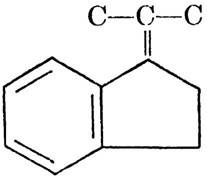
5-Isopropenylindane



B. P., °C @ 760mm

84 2^{1}

1-Isopropylideneindane

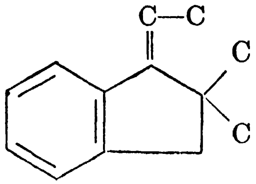


B. P., °C @ 760mm

133–135 17^{2}

$C_{13}H_{16}$

1-Ethylidene-2,2-dimethylindane

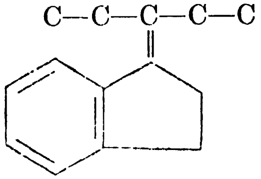


B. P., °C @ 760mm

112–114 13^{3}

$C_{14}H_{18}$

1-(3′-Pentylidene)-indane



B. P., °C @ 760mm

136–138 15^{2}

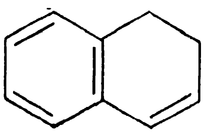
References on Indane with One Alkenyl or One Alkylidene Substitution

1. Arnold, R. T., J. Am. Chem. Soc. **61,** 1405 **1939.**
2. Courtot, C., Ann chim. [9] **5,** 52 **1916.**
3. Ramart-Lucas, and J. Hoch, Bull. soc. chim. [5] **5,** 818 **1938.**

3. DIHYDRONAPHTHALENE AND ITS ALKYL DERIVATIVES, C_nH_{2n-10}

$C_{10}H_{10}$

1,2-Dihydronaphthalene
(Δ^1-Dialin)



M. P., °C

−8

-4^{26}

-7– -5^{45}

-8– -7^{44}

-9– -7^{45}

$-8^{14, 30, 53}$

-9– -8^{55}

$-9^{16, 43, 46, 55}$

B. P., °C @ 760mm

211

$212^{10, 25}$

211–212^{29}

210–212^{9}

209–210^{26}

206–207^{17}

206.5–207 764^{16}

89–90 24^{55}

92.5 19^{44}

84 17^{48}

93	16[45]
89	16[52]
84.5	16[55]
91	15[53]
90	15[45]
82–83	15[31]
84–85	12[44]
83–83.5	12[18]
89	10[47]
78	9[52]
74.0–74.5	6[12]
83–84	5[26]

D_4^{20}

0.9966	
0.9974[55]	
0.9904	27° [15]
0.9926	25° [17]
0.9931	25° [16]
0.9963	21.5° [53]
0.9976	18.3° [52]
0.9982	18.2° [52]
0.9977	18.15° [52]
0.9983	18.1° [52]
0.99448	14.7° [29]
0.99688	12.7° [29]
0.99745	12.4° [29]
1.0031	10.5° [44]

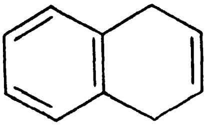
n_D^{20}

1.5817[18]	
1.5782	25° [17]
1.5789	25° [16]
1.58317	18.3° [52]
1.58326	18.1° [52]
1.57399	14.7° [29]
1.57549	12.7° [29]
1.57494	12.4° [29]
1.57637	$n_{H\alpha}^{18.3}$ [52]
1.57655	$n_{H\alpha}^{18.1}$ [52]
1.56827	$n_{H\alpha}^{14.7}$ [29]
1.56981	$n_{H\alpha}^{12.7}$ [29]
1.56910	$n_{H\alpha}^{12.4}$ [29]
1.60088	$n_{H\beta}^{18.3}$ [52]
1.60101	$n_{H\beta}^{18.1}$ [52]
1.59040	$n_{H\beta}^{14.7}$ [29]
1.59189	$n_{H\beta}^{12.7}$ [29]
1.59135	$n_{H\beta}^{12.4}$ [29]
1.61720	$n_{H\gamma}^{18.3}$ [52]
1.61738	$n_{H\gamma}^{18.1}$ [52]

Additional Data

$dD/dt = -0.0007473/°C$ (10 to 27°C)

1,4-Dihydronaphthalene



M. P., °C

24.5
28[40]
25.5[26]
25[52]
24.5–25.0[47]
24.5–25[44]
24.5–24.8[43]
24.5[3, 18, 46]
24[14, 49]
23.24[19]
16[22]
15.5[1]
15[27, 28]

B. P., °C @ 760mm

212[20, 33]	
208.5–209[40]	
205[2]	
199–201[54]	
211	713[1]
94.5	17[3, 44]
94	17[48]
86.5	12[18]
84	9.5[52]

D_4^{20}

0.9928	34.1° [52]
0.9935	33.3° [52]

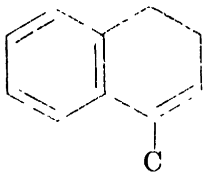
0.9928	32.7°[52]

n_D^{20}

1.5593[18]	
1.55474	33.3°[52]
1.55489	32.7°[53]
1.54963	$n_{H\gamma}^{33.3}$[52]
1.54992	$n_{H\alpha}^{32.7}$[52]
1.56730	$n_{H\beta}^{33.3}$[52]
1.56752	$n_{H\beta}^{32.7}$[52]
1.57861	$n_{H\gamma}^{33.3}$[52]
1.57866	$n_{H\gamma}^{32.7}$[52]

$C_{11}H_{12}$

4-Methyl-1,2-dihydronaphthalene



B. P., °C @ 760mm

228[7]	
107–108	14[32]
107	14[41]
92–93	14[31]
116–117	11[50, 51]
84	5[8]

D_4^{20}

0.9901[41]

n_D^{20}

1.5742	25°[8]
1.5618	21.5°[50, 51]

2-Methyl-x,x-dihydronaphthalene (a)

B. P., °C @ 760mm

107–108	14[50, 51]

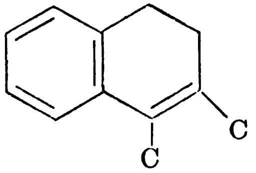
n_D^{20}

1.5522[50, 51]

(a) The structure of this compound was not clearly defined in the literature.

$C_{12}H_{14}$

3,4-Dimethyl-1,2-dihydronaphthalene



B. P., °C @ 760mm

250–251[42]	
114–116	15[42]

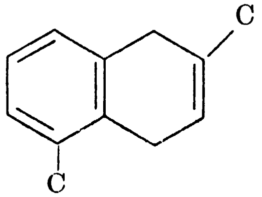
D_4^{20}

0.9885	17°[42]

n_D^{20}

1.5763[42]

2,5-Dimethyl-1,4-dihydronaphthalene



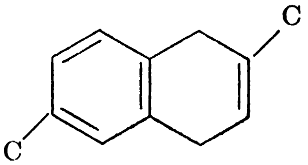
B. P., °C @ 760mm

118	10[24]

D_4^{20}

0.9700	16°[24]

2,6-Dimethyl-1,4-dihydronaphthalene

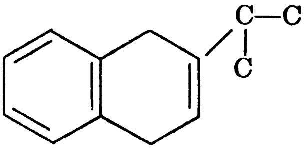


B. P., °C @ 760mm

125–126	15[23]

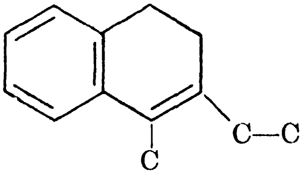
$C_{13}H_{16}$

2-Isopropyl-1,4-dihydronaphthalene



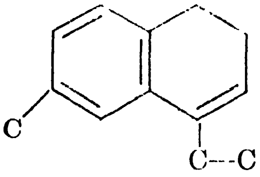
B. P., °C @ 760mm
122–127 12^{35}

3-Ethyl-4-methyl-1,2-dihydronaphthalene



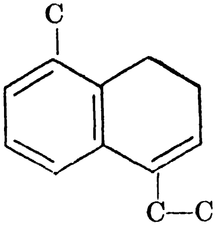
B. P., °C @ 760mm
135–145 11^{5}

4-Ethyl-6-methyl-1,2-dihydronaphthelene



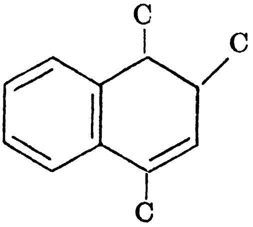
B. P., °C @ 760mm
135 16^{4}

4-Ethyl-8-methyl-1,2-dihydronaphthalene



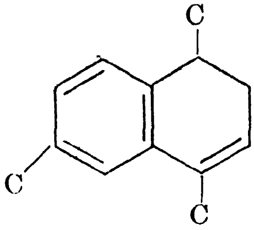
B. P., °C @ 760mm
130–131 12^{11}

1,2,4-Trimethyl-1,2-dihydronaphthalene



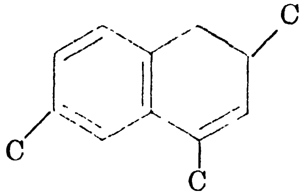
B. P., °C @ 760mm
109 11^{36}

1,4,6-Trimethyl-1,2-dihydronaphthalene



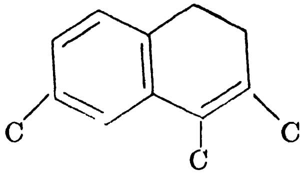
B. P., °C @ 760mm
135–138 13^{86}
122–123 12^{34}

2,4,6-Trimethyl-1,2-dihydronaphthalene



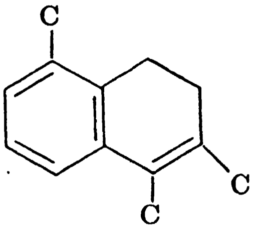
B. P., °C @ 760mm
115–117 10^{36}

3,4,6-Trimethyl-1,2-dihydronaphthalene



B. P., °C @ 760mm
145–150^{6}
130 13^{36}

3,4,8-Trimethyl-1,2-dihydronaphthalene



B. P., °C @ 760mm

130–131 11^{37}

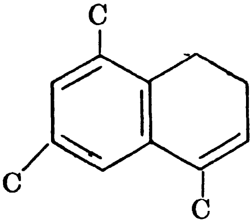
D_4^{20}

0.9760^{37}

n_D^{20}

1.5672^{37}

4,6,8-Trimethyl-1,2-dihydronaphthalene

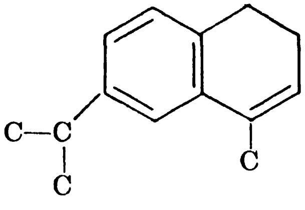


B. P., °C @ 760mm

143–145 18^{13}

$C_{14}H_{18}$

4-Methyl-6-isopropyl-1,2-dihydronaphthalene

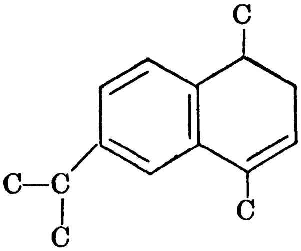


B. P., °C @ 760mm

137 12^{39}

$C_{15}H_{20}$

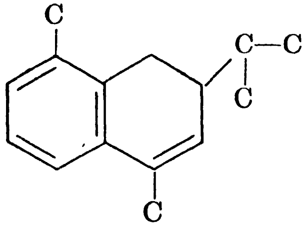
1,4-Dimethyl-6-isopropyl-1,2-dihydronaphthalene



B. P., °C @ 760mm

154–155 12^{38}

2-Isopropyl-4,8-dimethyl-1,2-dihydronaphthalene

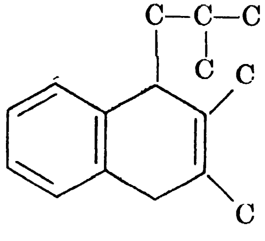


B. P., °C @ 760mm

108 0.8^{38}

$C_{16}H_{22}$

1-Isobutyl-2,3-dimethyl-1,4-dihydronaphthalene

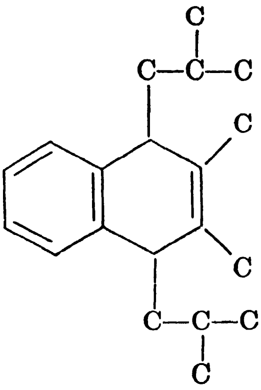


B. P., °C @ 760mm

150^{21}

$C_{20}H_{30}$

1,4-Diisobutyl-2,3-dimethyl-1,4-dihydronaphthalene



B. P., °C @ 760mm
180[21]

References on Dihydronaphthalene and Its Alkyl Derivatives

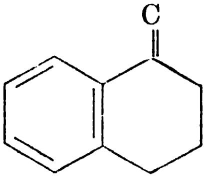
1. Bamberger, E., and W. Lodter, Ber. **20,** 1703 **1887.**
2. Berthelot, M., Ann. suppl. **5,** 367 **1867.**
3. Bonino, G. B., and P. Cella, Atti accad. Lincei [6] **15,** 572 **1932.**
4. Brunner, O., and F. Grof, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **142,** Abt. IIb, 682 **1933.**
5. Brunner, O., and F. Grof, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **142,** Abt. IIb, 730 **1933.**
6. Brunner, O., H. Hofer, and R. Stein, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **142,** Abt. IIb, 289 **1933.**
7. de Pommereau, H., Compt. rend. **172,** 1503 **1921.**
8. English, J., Jr., and G. Cavagliari, J. Am. Chem. Soc. **65,** 1085 **1943.**
9. Graebe, C., Ber. **5,** 677 **1872.**
10. Graebe, C., and P. A. Guye, Ber. **16,** 3028 **1883.**
11. Harvey, J., I. M. Heilbron, and D. G. Wilkinson, J. Chem. Soc. **1930,** 423.
12. Hayashi, T., Sci. Papers Inst. Phys. Chem. Res. (Tokyo) **23,** 274 **1934.**
13. Heilbron, I. M., and D. G. Wilkinson, J. Chem. Soc. **1930,** 2537.
14. Hückel, W., and H. Bretschneider, Ann. **540,** 157 **1939.**
15. Joglekar, M. S., Z. Physik **101,** 398 **1936.**
16. Kimura, S., Mem. Coll. Sci., Kyoto Imp. Univ. **14A,** 173 **1931;** Chem. Zentr. **1931,** II, 3476.
17. Kimura, S., Mem. Coll. Sci., Kyoto Imp. Univ. **14,** 303 **1931.**
18. Kohlrausch, K. W. F., and R. Seka, Ber. **71,** 1551 **1938.**
19. Küster, F. W., Z. physik. Chem. **8,** 577 **1891.**
20. Leonard, A. G. G., J. Chem. Soc. **97,** 1246 **1910.**
21. Lerer, M., Ann. combustibles liquides **10,** 455 **1935.**
22. Mameli, E., and A. Mossini, Giorn. chim. ind. applicata **15,** 161 **1933.**
23. Mayer, F., and E. Alken, Ber. **55,** 2278 **1922.**
24. Mayer, F., and T. Schulte, Ber. **55,** 2164 **1922.**
25. Meyer, R., and H. Fricke, Ber. **47,** 2765 **1914.**
26. Morton, R. A., and A. J. A. de Gouveia, J. Chem. Soc. **1934,** 916.
27. Padoa, M., Atti accad. Lincei [5] **28,** II, 239 **1919.**
28. Padoa, M., Gazz. chim. ital. **48,** II, 139 **1918.**
29. Pellini, G., Gazz. chim. ital. **31,** I, 1 **1901.**
30. Pohl, J., and M. Rawicz, Z. physiol. Chem. **104,** 95 **1919.**
31. Ramart-Lucas, and J. Hoch, Bull. soc. chim. [5] **5,** 848 **1938.**
32. Rapson, W. S., and R. Robinson, J. Chem. Soc. **1935,** 1533.
33. Röckemann, W., Arch. exptl. Path. Pharmakol. **92,** 52 **1922.**
34. Rupe, H., and F. Schütz, Helv. Chim. Acta **9,** 992 **1926.**
35. Ruzicka, L., and E. Capato, Ann. **453,** 62 **1927.**
36. Ruzicka, L., and L. Ehmann, Helv. Chim. Acta **15,** 140 **1932.**
37. Ruzicka, L., and J. R. Hosking, Helv. Chim. Acta **13,** 1402 **1930.**
38. Ruzicka, L., P. Pieth, T. Reichstein, and L. Ehmann, Helv. Chim. Acta **16,** 268 **1933.**
39. Ruzicka, L., and M. Stoll, Helv. Chim. Acta **5,** 923 **1922.**
40. Schlenk, W., and E. Bergmann, Ann. **463,** 1 **1928.**
41. Schroeter, G., Ber. **58,** 713 **1925.**
42. Schroeter, G., L. Lichtenstadt, and D. Irineu, Ber. **51,** 1587.**1918.**
43. Straus, F., Ber. **46,** 1051 **1913.**

44. Straus, F., and L. Lemmel, Ber. **46,** 232 **1913.**
45. Straus, F., and L. Lemmel, Ber. **54,** 25 **1921.**
46. Straus, F., and A. Rohrbacher, Ber. **54,** 40 **1921.**
47. Straus through W. A. Roth and K. von Auwers, Ann. **407,** 145 **1914.**
48. Stuurman, G., Proc. Acad. Sci. Amsterdam **38,** 450 **1935.**
49. Timmermans, J , Bull. soc. chim. Belg. **44,** 17 **1935.**
50. Veselý, V., and J. Kapp, Chem. Listy **24,** 97 **1930;** C.A. **24,** 5035 **1930;** Chem. Zentr. **1930,** I, 3307.
51. Veselý, V., and J. Kapp, Collection Czechoslov. Chem. Commun. **3,** 448 **1931.**
52. von Auwers, K., Ber. **46,** 2988 **1913.**
53. von Braun, J., and G. Kirschbaum, Ber. **54,** 597 **1921.**
54. von Pechmann, H., Ber. **16,** 516 **1883.**
55. Willstätter, R., and V. L. King, Ber. **46,** 527 **1913.**

4. TETRAHYDRONAPHTHALENE DERIVATIVES OF EMPIRICAL FORMULA C_nH_{2n-10}

$C_{11}H_{12}$

1-Methylene-1,2,3,4-tetrahydronaphthalene

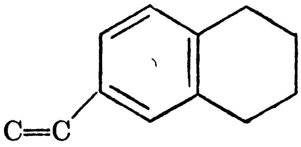


B. P., °C @ 760mm
103 14[8]

D_4^{20}
0.9836[8]

$C_{12}H_{14}$

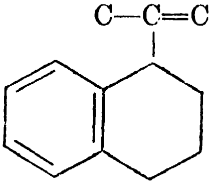
6-Ethenyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm
96 2[5]

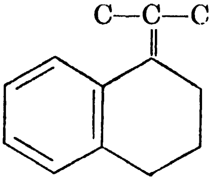
$C_{13}H_{16}$

1-Isopropenyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm
259–261 745[2]

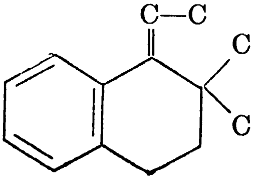
1-Isopropylidene-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm
251–253 771[2]
245–247 744[2]

$C_{14}H_{18}$

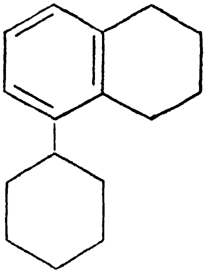
1-Ethylidene-2,2-dimethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm
122–123 14[7]

$C_{16}H_{22}$

5-Cyclohexyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm
118 0.2[1]

---

x-Cyclohexyl-1,2,3,4-tetrahydronaphthalene (a)

B. P., °C @ 760mm
147–149 3[6]

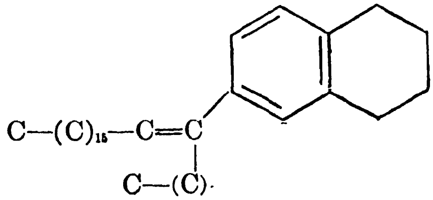
D_4^{20}
0.9891[6]
0.9939 D_{15}^{15} [6]

n_D^{20}
1.5490[6]
1.5420 40° [6]

(a) The structure of this compound was not clearly defined in the literature.

$C_{32}H_{54}$

6-(5′-Docosen-5′-yl)-1,2,3,4-tetrahydronaphthalene



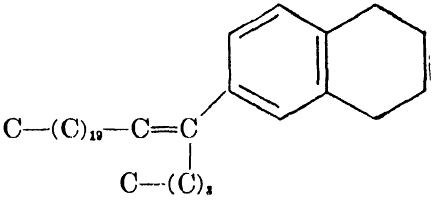
B. P., °C @ 760mm
263–264 4[4]

D_4^{20}
0.890 25° [3]

n_D^{20}
1.5048 25° [3]

$C_{36}H_{62}$

6-(5′-Hexacosen-5′-yl)-1,2,3,4-tetrahydronaphthalene



D_4^{20}
0.8790[3]

n_D^{20}
1.5030[3]

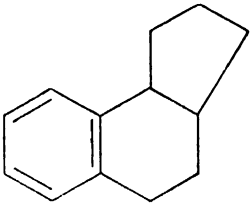
References on Tetrahydronaphthalene Derivatives of Empirical Formula C_nH_{2n-10}

1. Cook, J. W., and C. A. Lawrence, J. Chem. Soc. **1936,** 1431.
2. Kay, F. W., and A. Morton, J. Chem. Soc. **105,** 1565 **1914.**
3. Mikeska, L. A., Ind. Eng. Chem. **28,** 970 **1936.**
4. Mikeska, L. A., C. F. Smith, and E. Lieber, J. Org. Chem. **2,** 499 **1938.**
5. Newman, M. S., and H. V. Zahm, J. Am. Chem. Soc. **65,** 1097 **1943.**
6. Pokrovskaya, E. S., and T. G. Stepanseva, J. Gen. Chem. (U.S.S.R.) **9,** 1953 **1939;** C.A. **34,** 4731 **1940.**
7. Ramart-Lucas, and J. Hoch, Bull. soc. chim. [5] **5,** 848 **1938.**
8. Schroeter, G., Ber. **58,** 713 **1925.**

5. CYCLOPENTANOTETRAHYDRONAPHTHALENES AND THEIR ALKYL DERIVATIVES, C_nH_{2n-10}

$C_{13}H_{16}$

1,2-Cyclopentano-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

266–267	739.2[1, 2]
138	19[7]

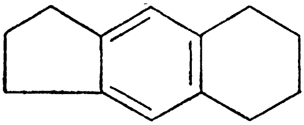
D_4^{20}

1.0090[2]	
1.009[1]	
1.0054	19.4° [7]

n_D^{20}

1.5538[1, 2]	
1.55297	19.4° [7]

6,7-Cyclopentano-1,2,3,4-tetrahydronaphthalene

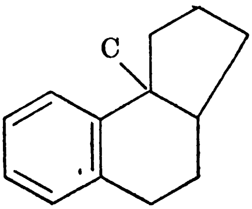


B. P., °C @ 760mm

125–126	6[11, 12]
104–106	3[3]

$C_{14}H_{18}$

1,2-Cyclopentano-1-methyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

128	12[7]
128–132	11[9, 10]

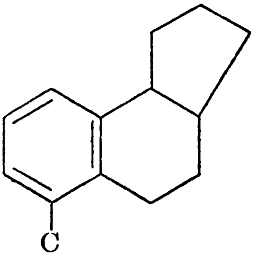
D_4^{20}

0.99798	17.8° [7]

n_D^{20}

1.5472[9, 10]	
1.54790	17.8° [7]

1,2-Cyclopentano-5-methyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

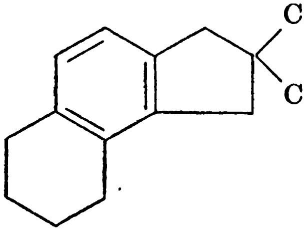
97–99	1[8]

n_D^{20}

1.5461	21° [8]

$C_{15}H_{20}$

2,2-Dimethyl-4,5-cyclohexanoindane



B. P., °C @ 760mm

156	18[5, 6]

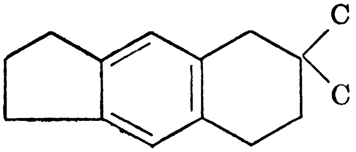
D_4^{20}

0.9685	18° [5]

n_D^{20}

1.5320[5]	

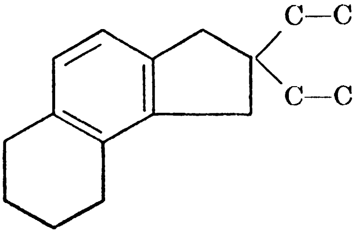
2,2-Dimethyl-6,7-cyclopentano-1,2,3,4-tetrahydronaphthalene



M. P., °C	
82[12]	

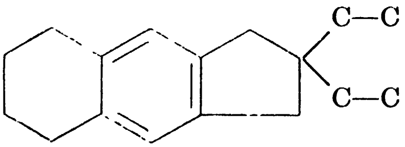
$C_{17}H_{24}$

2,2-Diethyl-4,5-cyclohexanoindane



B. P., °C @ 760mm	
163–165	12[5, 6]
164–166	11[13]

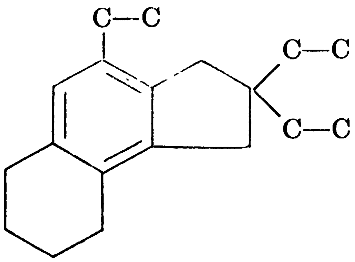
2,2-Diethyl-5,6-cyclohexanoindane



M. P., °C	
49[5, 6]	

$C_{19}H_{28}$

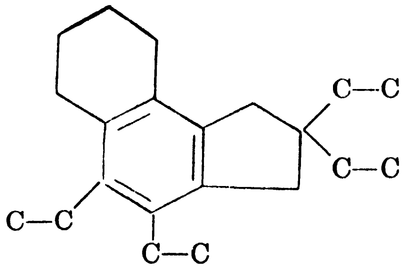
2,2,7-Triethyl-4,5-cyclohexanoindane



B. P., °C @ 760mm	
203–205	19[4]
D_4^{20}	
0.9673[4]	
n_D^{20}	
1.5352[4]	

$C_{21}H_{32}$

2,2,4,5-Tetraethyl-6,7-cyclohexanoindane



B. P., °C @ 760mm	
220–222	20[4]
D_4^{20}	
0.9647	27° [4]
n_D^{20}	
1.5365	27° [4]

References on Cyclopentanotetrahydronaphthalenes and Their Alkyl Derivatives

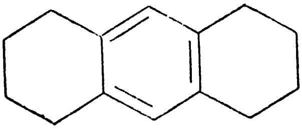
1. Deniscnko, Y. I., J. Gen. Chem. (U.S.S.R.) **8,** 410 **1938;** C.A. **32,** 7899 **1938;** Chem. Zentr. **1939,** II, 630.
2. Denisenko, Y. I., and A. D. Naber, Bull. acad. sci. U.R.S.S. **1937,** 939; Chem. Zentr. **1939,** I, 1540.
3. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **59,** 883 **1937.**
4. Fleischer, K., and E. Retze, Ber. **56,** 228 **1923.**
5. Fleischer, K., and F. Siefert, Ann. **422,** 272 **1921.**
6. Fleischer, K., and F. Siefert, Ber. **53,** 1255 **1920.**

7. Kon, G. A. R., J. Chem. Soc. **1933**, 1081.
8. McQuillin, F. J., and R. Robinson, J. Chem. Soc. **1938**, 1097.
9. Newman, M. S., priv. commun., Ohio State University, April 20, **1944**.
10. Newman, M. S., and R. D. Closson, J. Am. Chem. Soc. **66**, 1553 **1944**.
11. Sen-Gupta, S. C., Current Sci. **5**, 133 **1936**; C.A. **31**, 5789 **1937**; Chem. Zentr. **1937**, I, 76.
12. Sen-Gupta, S. C., J. Indian Chem. Soc. **16**, 89 **1939**.
13. von Braun, J., G. Kirschbaum, and H. Schumann, Ber. **53**, 1155 **1920**.

6. OCTAHYDROANTHRACENES AND THEIR ALKYL DERIVATIVES, C_nH_{2n-10}

$C_{14}H_{18}$

1,2,3,4,5,6,7,8-Octahydroanthracene
(Octracene)



M. P., °C

73.3
$73\text{–}74^{16,18}$
$72\text{–}74^{12}$
73.5^{4}
$73\text{–}73.5^{10}$
$73^{15,21}$
$72.0\text{–}73.0^{13}$
$72\text{–}73^{1,8}$
71.6^{11}
71^{17}

B. P., °C @ 760mm

299^{1}	
$293\text{–}295^{16}$	
160–163	18^{8}
167	13^{1}
167	12^{16}

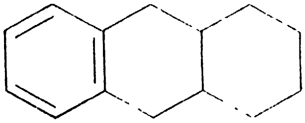
D_4^{20}

0.9626	$91.3°^{19}$
0.9648	$88.8°^{19}$
0.9703	$80°^{21}$
1.131	$0°^{22}$

n_D^{20}

1.53625	$88.8°^{19}$
1.5372	$80°^{21}$
1.53230	$n_{H\alpha}^{88\ 8}\ ^{19}$
1.54791	$n_{H\beta}^{88\ 8}\ ^{19}$
1.55788	$n_{H\gamma}^{88.8}\ ^{19}$

1,2,3,4,4a,9,9a,10-Octahydroanthracene



M. P., °C

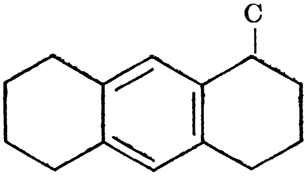
$71^{5,6,7,17}$
$63\text{–}64^{3}$
63.5^{14}

B. P., °C @ 760mm

$292\text{–}295^{5,6,7}$

$C_{15}H_{20}$

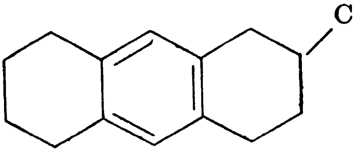
1-Methyl-1,2,3,4,5,6,7,8-octahydroanthracene



M. P., °C

$64\text{–}66^{20}$

2-Methyl-1,2,3,4,5,6,7,8-octahydroanthracene

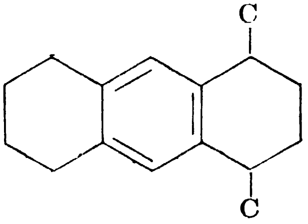


B. P., °C @ 760mm
163–165 13^{20}

D_4^{20}
0.9917 $18°\,^{20}$

$C_{16}H_{22}$

1,4-Dimethyl-1,2,3,4,5,6,7,8-octahydroanthracene



M. P., °C
$90–92^{20}$

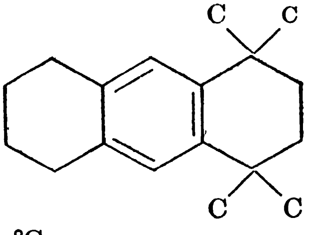
9,10-Dimethyl-x_8-octahydroanthracene (a)

M. P., °C
$140–141.5^{9}$

(a) The structure of this compound was not clearly defined in the literature.

$C_{18}H_{26}$

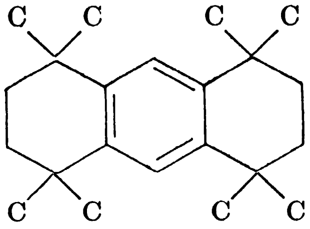
1,1,4,4-Tetramethyl-1,2,3,4,5,6,7,8-octahydroanthracene



M. P., °C
$90–91^{2}$

$C_{22}H_{34}$

1,1,4,4,5,5,8,8-Octamethyl-1,2,3,4,5,6,7,8-octahydroanthracene



M. P., °C
$220–222^{2}$

References on Octahydroanthracenes and Their Alkyl Derivatives

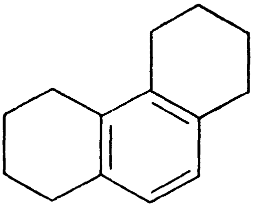
1. Boedtker, E., and O. Rambech, Bull. soc. chim. [4] **35**, 631 **1924**.
2. Bruson, H. A., and J. W. Kroeger, J. Am. Chem. Soc. **62**, 36 **1940**.
3. Cook, J. W., N. A. McGinnis, and S. Mitchell, J. Chem. Soc. **1944**, 286.
4. Fries, K., and K. Schilling, Ber. **65**, 1494 **1932**.
5. Godchot, M., Ann. chim. phys. [8] **12**, 468 **1907**.
6. Godchot, M., Bull. soc. chim. [3] **31**, 1339 **1904**.
7. Godchot, M., Compt. rend. **139**, 604 **1904**.
8. Kagehira, I., Bull. Chem. Soc. Japan **6**, 241 **1931**.
9. Kursanov, D. N., and R. R. Zel'vin, Compt. rend. acad. sci. U.R.S.S. **36**, 17 **1942**; Survey For. Petrol. Liter. Sept. 10, **1943**.
10. Larsen, R. G., R. E. Thorpe, and F. A. Armfield, Ind. Eng. Chem. **34**, 183 **1942**.
11. McVickers, W. H., J. K. Marsh, and A. W. Stewart, J. Chem. Soc. **127**, 999 **1925**.
12. Meerwein, H., and A. Migge, Ber. **62**, 1046 **1929**.
13. Orchin, M., J. Am. Chem. Soc. **66**, 535 **1944**.

14. Prokopets, E. I., J. Applied Chem. (U.S.S.R.) **11,** 835 **1938.**
15. Prokopets, E. I., G. E. Gavrilova, and L. A. Klimova, J. Applied Chem. (U.S.S.R.) **11,** 823 **1938;** C.A. **33,** 1717 **1939.**
16. Schroeter, G., Ber. **57,** 1990 **1924.**
17. Schroeter, G., Ber. **57,** 2003 **1924.**
18. Schroeter, G., Ber. **60,** 2035 **1927.**
19. von Auwers, K., and F. Krollpfeiffer, Ann. **430,** 230 **1923.**
20. von Braun, J., O. Bayer, and L. F. Fieser, Ann. **459,** 287 **1927.**
21. Waterman, H. I., J. J. Leendertse, and A. C. Cranendonk, Rec. trav. chim. **58,** 83 **1939.**
22. Ziegler, K., and F. Ditzel, Ann. **473,** 194 **1929.**

7. OCTAHYDROPHENANTHRENES AND THEIR ALKYL DERIVATIVES, C_nH_{2n-10}

$C_{14}H_{18}$

1,2,3,4,5,6,7,8-Octahydrophenanthrene
(Octanthrene)



M. P., °C
16.7[24, 25, 27, 31]
16.6[8]
16.5[26]

B. P., °C @ 760mm

295[24, 25, 36]	
299	766[27]
179–180	20[31]
172–173	20[8]
168	16.5[26]
169	15[25]
168–172	14[25]
167.5	13[24, 25, 27]
135–136	6[8]

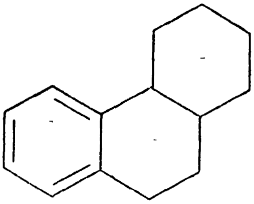
D_4^{20}

1.025[35]	
1.026[24, 25]	
1.0313	12.8° [35]

n_D^{20}

1.5668[35]	
1.5640	25° [8]
1.5669	17° [31]
1.57006	12.8° [35]
1.56588	$n_{H\alpha}^{12.8}$ [35]
1.58189	$n_{H\beta}^{12.8}$ [35]
1.59185	$n_{H\gamma}^{12.8}$ [35]

1,2,3,4,4a,9,10,10a-Octahydrophenanthrene



M. P., °C
95 (b)[5]

B. P., °C @ 760mm

280–285[3]	
283–284	744.5[7]
282–284	741[28]
146–147	20[14]
159	15[4]
149–150	13[9]
123–124	13[8]
135.5–135.7 (b) (c)	10.5–10.8[32]

146–147	10[18]
138–139	10[14]
142.6–142.8 (a) (b)	9.2[32]
135	9[2]
130	7[2]
135–137	6.5[10]
94–95 (b)	1.5[19]
88–90 (a)	0.1–0.15[5]

D_4^{20}

1.006 (b)[5]	
1.012[23]	
0.997325	32°[2]
0.9930	30°[2]
0.9828 (b) (c)	25°[32]
0.9840 (b)	25°[19]
1.0053 (a) (c)	25°[32]
1.0067	25°[18]
1.0072 (a)	25°[5]
1.0148	17°[7]
0.993	15°[3]
1.0164 (a)	13°[5]
1.006	0°[3]

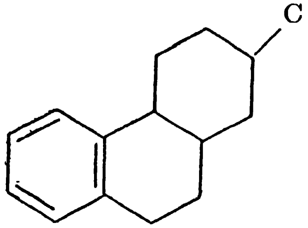
n_D^{20}

1.5599[23]	
1.548575	32°[2]
1.54940	30°[2]
1.5528	25°[9, 18]
1.5528 (b)	20.7°[5]
1.5549 (a)	20.7°[5]
1.5527	19.2°[4]
1.5569	17°[7]
1.537	15°[3]
1.5452 (b)	15°[19]
1.5460 (b) (c)	15°[32]
1.5586 (a)	12.2°[5]
1.5592 (a) (c)	10.6°[32]

(a) This constant was determined on the *cis* isomer of the compound.
(b) This constant was determined on the *trans* isomer of the compound.
(c) This constant was determined on the *dl* form of the compound.

$C_{15}H_{20}$

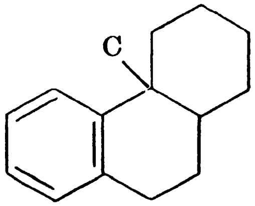
2-Methyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene



B. P., °C @ 760mm

137	6[2]

4a-Methyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene



B. P., °C @ 760mm

155–157	18[14]
157	16[11]
145–147	10[18]
98–100	0.5–1.0[15, 16]

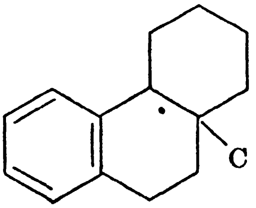
D_4^{20}

1.0025	25°[14]
1.0045	25°[18]
1.0082	18.2°[11]

n_D^{20}

1.5528[15, 16]	
1.5508	25°[15, 16, 18]
1.5559	25°[14]
1.55437	18.2°[11]

10a-Methyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene



B. P., °C @ 760mm

133	2.8^{11}

D_4^{20}

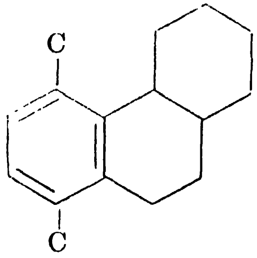
1.0054	18.5°^{11}

n_D^{20}

1.55254	18.5°^{11}

$C_{16}H_{22}$

5,8-Dimethyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene



B. P., °C @ 760mm

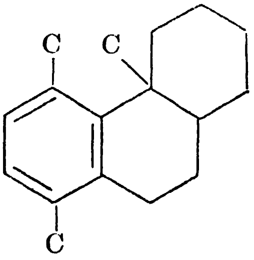
154–156	6^{20}

n_D^{20}

1.5498	25°^{20}

$C_{17}H_{24}$

4a,5,8-Trimethyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene



B. P., °C @ 760mm

155–156	4^{20}

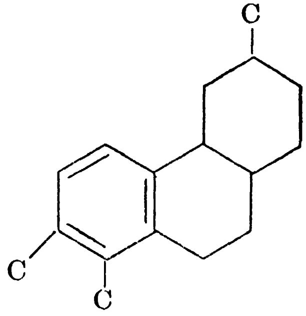
D_4^{20}

0.9975	25°^{20}

n_D^{20}

1.5460	25°^{20}

3,7,8-Trimethyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene

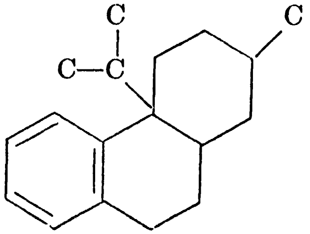


B. P., °C @ 760mm

117–120	0.06^{22}

$C_{18}H_{26}$

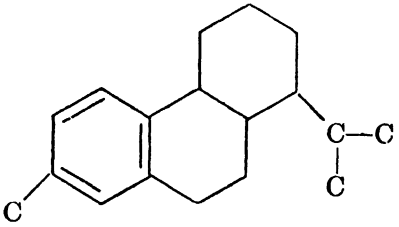
2-Methyl-4a-isopropyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene



B. P., °C @ 760mm

123–127	2^{17}

1-Isopropyl-7-methyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene



B. P., °C @ 760mm

195–197.5	19^{28}
163–165	10$^{1, 24}$
195–198	9^{6}

D_4^{20}

0.9578^{1,34}

0.9647 15°^{6}

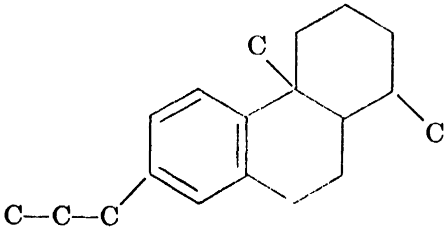
n_D^{20}

1.53020^{34}

1.53023^{1,34}

$C_{19}H_{28}$

1,4a-Dimethyl-7-*n*-propyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene
(Pinabietene)



B. P., °C @ 760mm

191–194 10^{33}

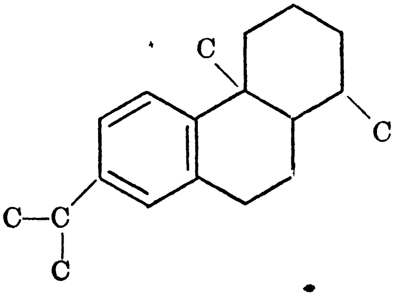
191–193 10^{33}

D_4^{20}

0.9734^{33}

0.9740^{33}

1,4a-Dimethyl-7-isopropyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene
(Abietene)



B. P., °C @ 760mm

200–202 17^{12}

200–202 14.5^{13}

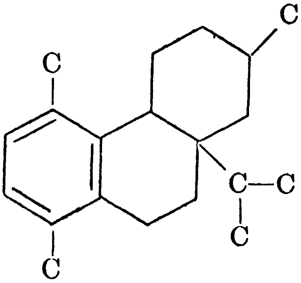
180 12^{29}

n_D^{20}

1.5354 25°^{29}

$C_{20}H_{30}$

2,5,8-Trimethyl-10a-isopropyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene
(Methyldextropimarin)



B. P., °C @ 760mm

140–145 0.3^{21}

D_4^{20}

0.9587 22°^{21}

n_D^{20}

1.5301 22°^{21}

1,4a,x-Trimethyl-7-isopropyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene (a)
(Methylabietene)

B. P., °C @ 760mm

194–196 6^{30}

D_4^{20}

0.9661 24°^{30}

n_D^{20}

1.53836 25°^{30}

Additional Data

$[\alpha]_D^{24} = +110.2°$^{30}

(a) The structure of this compound was not clearly defined in the literature.

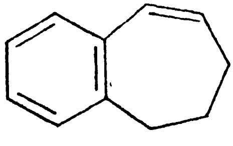
References on Octahydrophenanthrenes and Their Alkyl Derivatives

1. Adelson, D. E., and M. T. Bogert, Chem. Revs. **24,** 135 **1939.**
2. Bardhan, J. C., and S. C. Sengupta, J. Chem. Soc. **1932,** 2520.
3. Breteau, P., Compt. rend. **140,** 942 **1905.**
4. Cook, J. W., and C. L. Hewett, J. Chem. Soc. **1933,** 1098.
5. Cook, J. W., C. L. Hewett, and A. M. Robinson, J. Chem. Soc. **1939,** 168.
6. Czerny, O., Bul. Soc. Chim. România, **7,** 91 **1925;** C.A. **20,** 1320 **1926;** Chem. Zentr. **1926,** I, 2803.
7. Denisenko, Y. I., and V. M. Kotel'nikova, J. Gen. Chem. (U.S.S.R.) **7,** 1357 **1937;** Chem. Zentr. **1937,** II, 2990.
8. Durland, J. R., and H. Adkins, J. Am. Chem. Soc. **59,** 135 **1937.**
9. Durland, J. R., and H. Adkins, J. Am. Chem. Soc. **60,** 1501 **1938.**
10. Fulton, J. D., and R. Robinson, J. Chem. Soc. **1933,** 1463.
11. Kon, G. A. R., J. Chem. Soc. **1933,** 1081.
12. Levy, P., Ber. **39,** 3043 **1906.**
13. Levy, P., Ber. **40,** 3658 **1907.**
14. Nenitzescu, C. D., E. Ciorănescu, and M. Maican, Ber. **74,** 687 **1941.**
15. Newman, M. S., priv. commun., Ohio State University, April 20, **1944.**
16. Newman, M. S., and M. D. Farbman, J. Am. Chem. Soc. **66,** 1550 **1944.**
17. Orcutt, R. M., and M. T. Bogert, J. Org. Chem. **4,** 543 **1939.**
18. Perlman, D., D. Davidson, and M. T. Bogert, J. Org. Chem. **1,** 288 **1936.**
19. Pinkney, P. S., G. A. Nesty, D. E. Pearson, and C. S. Marvel, J. Am. Chem. Soc. **59,** 2666 **1937.**
20. Popa, D., D. Perlman, and M. T. Bogert, J. Am. Chem. Soc. **60,** 319 **1938.**
21. Ruzicka, L., and F Balas, Helv. Chim. Acta **7,** 875 **1924.**
22. Ruzicka, L., E. Rey, and W. J. Smith, Helv. Chim. Acta **26,** 2057 **1943.**
23. Schmidt, J., and R. Mezger, Ber. **40,** 4240 **1907.**
24. Schroeter, G., Ber. **57,** 1990 **1924.**
25. Schroeter, G., Ber. **57,** 2025 **1924.**
26. Schroeter, G., Ber. **60,** 2035 **1927.**
27. Schroeter, G., Brennstoff-Chem. **1,** 39 **1920.**
28. Schultze, W., Ann. **359,** 129 **1908.**
29. Sterling, E. C., and M. T. Bogert, J. Org. Chem. **4,** 2028 **1939.**
30. Suzuki, K., Sci. Papers Inst. Phys. Chem. Research (Tokyo) **26,** 98 **1935.**
31. van de Kamp, J., and E. Mosettig, J. Am. Chem. Soc. **57,** 1107 **1935.**
32. van de Kamp, J., and E. Mosettig, J. Am. Chem. Soc. **58,** 1062 **1936.**
33. Virtanen, A. I., Ann. **424,** 150 **1921.**
34. Virtanen, A. I., Ber. **53,** 1880 **1920.**
35. von Auwers, K., and F. Krollpfeiffer, Ann. **430,** 230 **1923.**
36. von Braun, J., and O. Bayer, Ber. **58,** 2667 **1925.**

8. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-10}

$C_{11}H_{12}$

1,2-Benzocycloheptene-3



B. P., °C @ 760mm

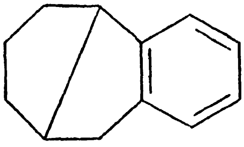
233.5–234 757[11]

D_4^{20}

1.009 4° [11]

$C_{12}H_{14}$

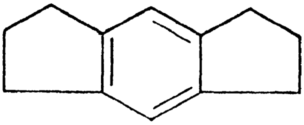
2,3-Benzobicyclo-[3,3,0]-octane



B. P., °C @ 760mm

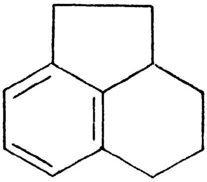
118–124 9[3]

5,6-Cyclopentanoindane
(s-Hydrindacene)



M. P., °C
52–54[1]

2a,3,4,5-Tetrahydroacenaphthene
(Tetraphthene) (a)



B. P., °C @ 760mm

251[16]	
252[22]	
251–252[12]	
245–248[10]	
249.5	719[2, 12]
138–139	24[8]
115	12[21]
112–115	12[19]

D_4^{20}

1.0065	25°[10]
1.0290	21°[8]
1.018	15°[19]

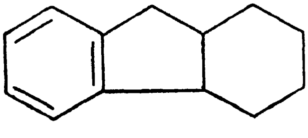
n_D^{20}

1.59737[19]	
1.5550	25°[10]
1.5777	21°[8]

(a) Reference 21 gives this name and formula. The other references do not clearly define the structure.

$C_{13}H_{16}$

1,2,3,4,4a,9a-Hexahydrofluorene



B. P., °C @ 760mm

137	15[4]
127	15[5]

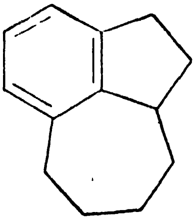
D_4^{20}

0.9880[4]	
1.019	10.9°[5]

n_D^{20}

1.5448[4]	
1.5572	10.9°[5]

Cycloheptano-[cd]-indane
(Homotetraphthene)



B. P., °C @ 760mm

127–128	12[23]

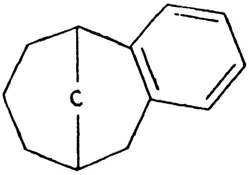
D_4^{20}

1.0364	17.1°[20]
1.0295	15°[28]

n_D^{20}

1.5750	22°[28]
1.57362	$n_{H\alpha}^{17.1}$ [20]
1.59350	$n_{H\beta}^{17.1}$ [20]
1.60645	$n_{H\gamma}^{17.1}$ [20]
1.57928	$n_{He}^{17.1}$ [20]

2,3-Benzobicyclo-[3,3,1]-nonane



B. P., °C @ 760mm

123	15[5]
85	0.3[5]

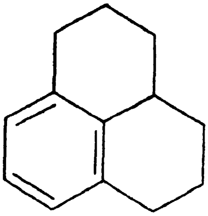
D_4^{20}

1.020	14.0°[5]

n_D^{20}

1.5580	14°[5]

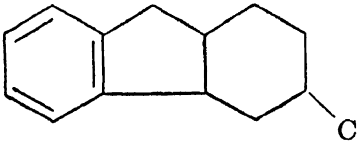
3a,4,5,6-Tetrahydrophenalan



B. P., °C @ 760mm	
132–135	14[24]
D_4^{20}	
1.027	23°[24]
n_D^{20}	
1.5636	23°[24]

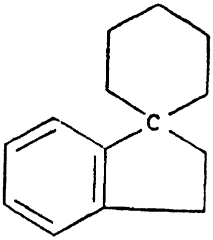
$C_{14}H_{18}$

3-Methyl-1,2,3,4,4a,9a-hexahydrofluorene



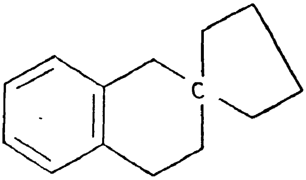
B. P., °C @ 760mm	
128	14[26]
D_4^{20}	
0.99[26]	
n_D^{20}	
1.5455[26]	

Spiro[indane-1,1′-cyclohexane]



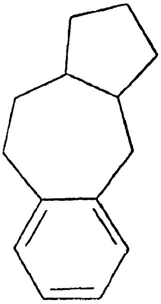
B. P., °C @ 760mm	
135.5–135.7	10[14]
n_D^{20}	
1.5468	25°[14]

Spiro[1,2,3,4-tetrahydronaphthalene-2,1′-cyclopentane]



B. P., °C @ 760mm	
113–114	4[17]

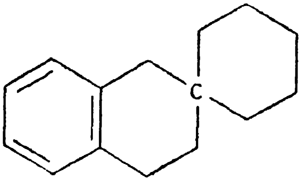
1,2-Cyclopentano-4,5-benzocycloheptane (Octahydrobenzazulene)



M. P., °C	
29–30[6]	

$C_{15}H_{20}$

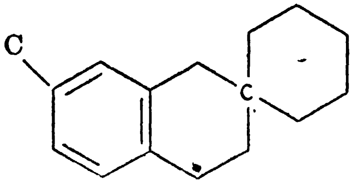
Spiro[1,2,3,4-tetrahydronaphthalene-2,1′-cyclohexane]



B. P., °C @ 760mm	
115–117	3[18]
D_4^{20}	
0.98886	30.4°[18]
n_D^{20}	
1.54314	30°[18]

$C_{16}H_{22}$

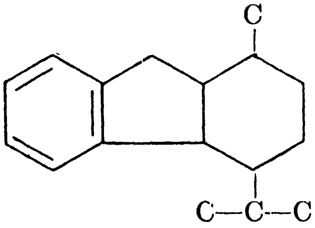
Spiro[7-methyl-1,2,3,4-tetrahydronaphthalene-2,1'-cyclohexane]



B. P., °C @ 760mm	
155–156	8^{18}

$C_{17}H_{24}$

1-Methyl-4-isopropyl-1,2,3,4,4a,9a-hexahydrofluorene



B. P., °C @ 760mm	
153–155	10^{25}
150	10^{15}
105	0.6^{15}

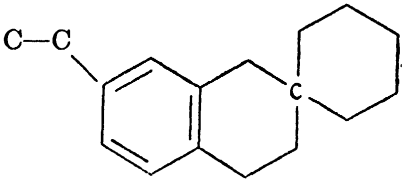
D_4^{20}

0.9843	$21°$ 15

n_D^{20}

1.5397	$21°$ 15

Spiro[7-ethyl-1,2,3,4-tetrahydronaphthalene-2,1'-cyclohexane]



B. P., °C @ 760mm	
168–169	8^{18}

D_4^{20}

0.972787	$24°$ 18

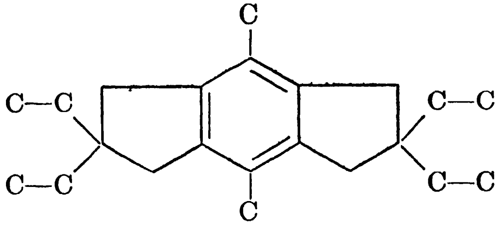
n_D^{20}

1.538808^{18}

This series continued on next page

$C_{22}H_{34}$

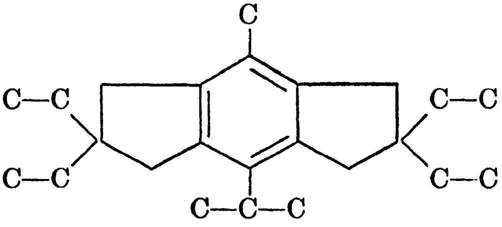
1,4-Dimethyl-2,3,5,6-di-[2′,1′-(4′,4′-diethylcyclopentano)]-benzene



M. P., °C
69–71[9]

$C_{24}H_{38}$

1-Methyl-4-isopropyl-2,3,5,6-di-[2′,1′-(4′,4′-diethylcyclopentano)]-benzene



M. P., °C
69–71[7]

B. P., °C @ 760mm
215–220 12[7]

D_4^{20}
0.9466 22° [7]

n_D^{20}
1.5247[7]

References on Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-10}

1. Arnold, R. T., and R. A. Barnes, J. Am. Chem. Soc. **66**, 960 **1944**.
2. Bamberger, E., and W. Lodter, Ber. **20**, 3073 **1887**.
3. Chatterjee, N. N., J. Indian Chem. Soc. **15**, 211 **1938**.
4. Cook, J. W., and C. L. Hewett, J. Chem. Soc. **1933**, 1098.

5. Cook, J. W., and C. L. Hewett, J. Chem. Soc. **1936,** 62.
6. Cook, J. W., N. A. McGinnis, and S. Mitchell, J. Chem. Soc. **1944,** 286.
7. Fleischer, K., and W. W. Melber, Ann. **422,** 231 **1921.**
8. Fleischer, K., and F. Siefert, Ann. **422,** 272 **1921.**
9. Freund, M., K. Fleischer, and E. Gofferjé, Ann. **414,** 1 **1918.**
10. Kagehira, I., Bull. Chem. Soc. Japan **6,** 241 **1931.**
11. Kipping, F. S., and A. E. Hunter, J. Chem. Soc. **83,** 246 **1903.**
12. Lebeau, P., and M. Picon, Compt. rend. **159,** 70 **1914.**
13. Nenitzescu, C. D., E. Ciorănescu, and M. Maican, Ber. **74,** 687 **1941.**
14. Perlman, D., D. Davidson, and M. T. Bogert, J. Org. Chem. **1,** 288 **1936–1937.**
15. Ruzicka, L., and E. Peyer, Helv. Chim. Acta **18,** 676 **1935.**
16. Sabatier, P., and J. B. Senderns, Compt. rend. **132,** 1254 **1901.**
17. Sen-Gupta, S. C., J. Indian Chem. Soc. **11,** 389 **1934.**
18. Sen-Gupta, S. C., J. Indian Chem. Soc. **19,** 467 **1942.**
19. Spilker, A., and K. Zerbe, Z. angew. Chem. **39,** 1138 **1926.**
20. von Auwers through J. von Braun and E. Rath, Ber. **60,** 1182 **1927.**
21. von Braun, J., and G. Kirschbaum, Ber. **55,** 1680 **1922.**
22. von Braun, J., G. Kirschbaum, and H. Schumann, Ber. **53,** 1155 **1920.**
23. von Braun, J., and E. Rath, Ber. **60,** 1182 **1927.**
24. von Braun, J., and J. Reutter, Ber. **59,** 1922 **1926.**
25. Wallach, O., Ann. **305,** 261 **1899.**
26. Wallach, O., Ber. **29,** 2955 **1896.**

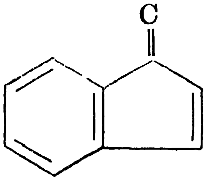
III. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-12}

1. Indene with One Alkenyl or One Alkylidene Substitution
2. Naphthalene and Its Alkyl Derivatives
3. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-12}

1. INDENE WITH ONE ALKENYL OR ONE ALKYLIDENE SUBSTITUTION, C_nH_{2n-12}

$C_{10}H_8$

1-Methyleneindene

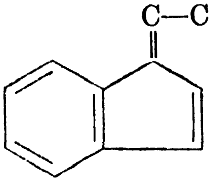


M. P., °C
37[3, 4]

B. P., °C @ 760mm
95–97 17[3]

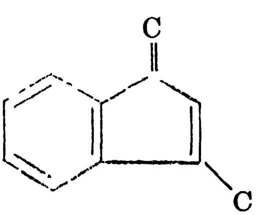
$C_{11}H_{10}$

1-Ethylideneindene



B. P., °C @ 760mm
119–121 17[3]

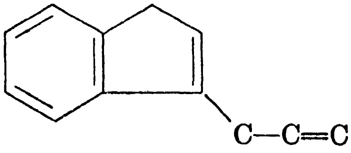
1-Methylene-3-methylindene



B. P., °C @ 760mm
102–104 11[8]

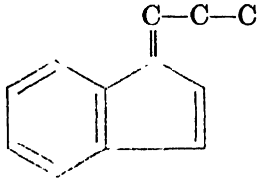
$C_{12}H_{12}$

3-(Propen-2′-yl)-indene



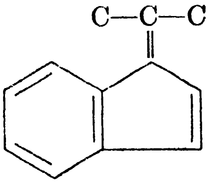
B. P., °C @ 760mm
138 27[7]

1-Propylideneindene



B. P., °C @ 760mm
140–141 20[3]

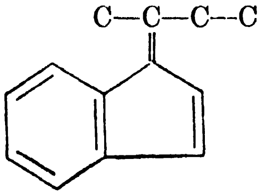
1-Isopropylideneindene



B. P., °C @ 760mm
142 16[6]
129–130 8[3]

$C_{13}H_{14}$

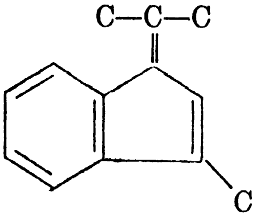
1-*sec*-Butylideneindene



B. P., °C @ 760mm

151–152 15^8

1-Isopropylidene-3-methylindene



M. P., °C

51^2

49^1

$48–49^9$

B. P., °C @ 760mm

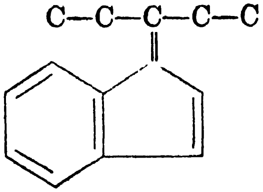
145–148 11^1

144–148 11^9

105 $0.2–0.5^9$

$C_{14}H_{16}$

1-(3′-Pentylidene)-indene

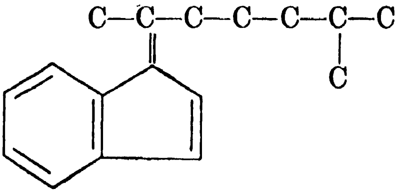


B. P., °C @ 760mm

140–142 15^3

$C_{17}H_{22}$

2-Methyl-6-indenylideneheptane



B. P., °C @ 760mm

120 0.2^5

D_4^{20}

0.9666 $23°^5$

n_D^{20}

1.5733 $23°^5$

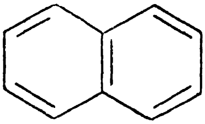
References on Indene with One Alkenyl or One Alkylidene Substitution

1. Chatterjee, N. N., J. Indian Chem. Soc. **14,** 417 **1937.**
2. Chatterjee, N., Science and Culture **1,** 584 **1936;** Chem. Zentr. **1936,** II, 1354.
3. Courtot, C., Ann. chim. [9] **4,** 168 **1915.**
4. Grignard, V., and C. Courtot, Compt. rend. **160,** 500 **1915.**
5. Ruzicka, L., and E. Peyer, Helv. Chim. Acta **18,** 676 **1935.**
6. Thiele, J., and K. Merck, Ann. **415,** 257 **1918.**
7. Wislicenus, W., and W. Hentrich, Ann. **436,** 9 **1924.**
8. Wuest, H.-M., Ann. **415,** 291 **1918.**
9. Ziegler, K., and F. Crössmann, Ann. **511,** 89 **1934.**

2. NAPHTHALENE AND ITS ALKYL DERIVATIVES, C_nH_{2n-12}

$C_{10}H_8$

Naphthalene



M. P., °C

80 .0$_1$
81 (a)
80.98 ± 0.15 (b)[225]
80.8[102, 191, 193]
80–80.7[224]
80.6[126]
80.5[44, 114]
80.4–80.5[103]
80.0–80.5[208]
80–80.5[45]
80.4[162, 263]
80.3[117]
80.3 (c)[116]
80.25–80.30[267]
80.24 ± 0.01 (c)[141]
80.23[58]
80.21[58]
80.20[207]
80.2[211, 238, 281]
80.15[27, 140]
80.12[228]
80.10–80.12[229]
80.10[51, 52, 74, 231]
80.1 (d)
80.05–80.1 (c)[266]
79.9–80.1[139]
80.09[268]
80.08[67]
80.05–80.07[17]
80.061 ± 0.002[165]
80.06[39, 137, 147]
80.05[28, 100, 133]
80.04[261]
80.00[40, 94]
80.0[26, 115, 117, 136, 167, 194, 222]
80 (e)
79.9–80[220]
79.5–80.0[209]
79.5–80[216]
79.95[231]
79.91[4, 5]
79.9[18, 19, 168, 210]
79.87[12, 56, 237]
79.866[197]
79.86[88]
79.6–79.8[269]
79.7[150]
79.60–79.64[179]
79.60[143]
79.6[70]
79.5 (f)
79.4[86, 156]
79.33[123]
79.32[123]
79.3[157, 201, 279]
79.25[254]
79.2[6, 110, 206]
79 (g)

	atm.
190.1	3,494 (b)[230, 231]
180.1	3,097 (b)[230, 231]
169.8	2,724 (b)[231]
170.1	2,712 (b)[230]
159.8	2,405 (b)[231]
150.1	2,061 (b)[230]
148.9	2,035 (b)[231]
138.8	1,719[231]
138.9	1,705 (b)[231]
129.91	1,450 (b)[231]
130	1,430[11]
129.92	1,416[231]
125.01	1,325 (b)[231]
119.92	1,155[231]
120.1	1,151 (b)[230]
115.06	1,016 (b)[231]
110.02	853[231]
110.01	853[231]

105.71	740 (b)[231]
99.98	561[231]
100	560[11]
95.21	429 (b)[231]
91.14	300[94]
91.10	300[94]
89.11	281 (b)[231]
89.97	278[231]
90.25	275[94]
90	275[11]
89.20	250[94]
88.35	225[94]
87.45	200[94]
86.45	175[94]
86.01	173 (b)[231]
85.50	150[94]
84.50	125[94]
83.51	106 (b)[231]
83.65	100[94]
83	80[11]
82.80	75[94]
81.80	50[94]
80.85	25[94]
80.10	0[231]
79.95	0[94]

B. P., °C @ 760mm

217.98
218.47 (b)[55]
218.2[88, 124]
218.12[246]
218.06[42, 55, 100]
218.050 (b)[89]
218.05 (h)
218.04[7]
218.0 ± 0.02[243]
218.0[170, 195, 214, 263, 264]
218 (i)
217.8–218.0[93]
217.98 ± 0.01[250, 263]
217.97_3 [66]
217.96[39, 90, 147, 242, 249]
217.96 ± 0.03[141]
217.95[73]
217.94[41]
217.9[26]
217.8[169]
217.68[100]

269.51	2,149.31[55]
267.03	2,052.28[55]
264.45	1,957.02[55]
263.01	1,912.86[55]
259.26	1,784.83[55]
255.65	1,657.39[55]
253.93	1,600.94[55]
249.92	1,489.60[55]
247.58	1,413.80[55]
245.99	1,378.68[55]
243.98	1,317.86[55]
243.32	1,306.75[55]
241.34	1,252.27[55]
238.79	1,184.58[55]
236.25	1,111.33[55]
234.68	1,086.63[55]
234.50	1,082.12[55]
233.94	1,070.92[55]
230.86	1,002.31[55]
228.55	958.26[55]
227.02	927.75[55]
225.39	894.87[55]
224.1	881.0[170]
223.9	879.7[170]
223.8	878.5[170]
224.45	877.29[55]
221.45	825.2[175]
221.35	816.78[55]
220	800[38]
219.95	800[100]
219.68	795[100]
219.40	790[100]
219.11	785[100]
218.83	780[100]
218.54	775[100]
218.25	770[100]
217.4–217.8	769[154]
218.5	767.63[54]
217.97	765[100]
218.5	763[13]
218.152 (b)	762.02[89]

218.047 (b)	760.37[89]
218.061 (b)	760.24[89]
217.87	759.2[175]
217.34	755.8[175]
217.40	755[100]
217.6	752.20[54]
217	751[108]
217.6	750.1[88]
217.11	750[100]
216.4–216.8	747.6[110]
216.82	745[100]
216.89	744[155]
216.7	741.9[187]
216.53	740[100]
216.45	737.6[170]
216.4	737.6[170]
216.7	736.99[54]
216.24	735[100]
215.95	730[100]
215.65	725[100]
215.7	720.39[54]
215.36	720[100]
215.06	715[100]
214.76	710[100]
215.07	708.93[55]
214.45	705[100]
214.14	700[100]
214	700[38]
213.51	690[100]
213.30	682.7[175]
212.87	680[100]
212.23	670[100]
212.17	667.8[175]
212.06	660.16[55]
211.58	660[100]
210.94	650[100]
210.28	640[100]
209.60	630[100]
209.83	627.85[55]
209.62	625.95[55]
208.93	620[100]
208.24	610[100]
208	600[38]
207.55	600[100]
206.84	590[100]
207.00	589.70[55]
206.92	584.01[55]
206.00	581.9[175]
206.12	580[100]
205.78	576.2[175]
206.05	576.18[55]
205.40	570[100]
205.31	564.76[55]
204.66	560[100]
203.91	550[100]
203.15	540[100]
203.26	538.37[55]
202.37	530[100]
202.2	520.0[170]
201.59	520[100]
202.2	519.0[170]
202.1	518.5[170]
200.80	510[100]
200.50	505.7[175]
200	502.1[60]
200.00	500[100]
200	500[38]
199.18	490[100]
198.99	484.84[55]
198.53	482.1[175]
198.34	480[100]
197.48	470[100]
196.96	464.1[175]
196.60	460[100]
196.85	458.41[55]
196.72	458.31[55]
194.78	440[100]
193.85	430[100]
192.91	420[100]
193.05	417.97[55]
191.96	410[100]
191.00	400[100]
191	400[38]
191.28	398.89[55]
191.20	397.68[55]
190.66	391.40[55]
190.02	390[100]
189.02	380[100]

188.36	369.77[55]
187.43	358.98[55]
185.34	347.6[175]
184.90	337.43[55]
184.56	334.20[55]
183.89	326.22[55]
181.20	310.6[175]
180.80	300.82[55]
180	300[38]
180	299.1[60]
178.44	290.0[175]
179.39	289.22[55]
178.92	286.60[55]
178.41	281.55[55]
178.0	275.2[170]
177.11	272.34[55]
177.3	269.7[170]
175.10	260.8[175]
173.14	243.53[55]
172.05	235.21[55]
171.23	231.16[55]
166	200[38]
163.13	187.1[175]
163.9	181.8[170]
160	172[13]
160	168.4[60]
160.9	168.1[170]
158.95	165.1[175]
149.7	117.9[170]
148.7	114.5[170]
147.8	111.4[170]
144.45	103.5[175]
144	100[38]
140	88.7[60]
138	80[38]
133.72	71.2[175]
132.6	67.0[170]
131.1	63.2[170]
130	61.90[10]
130.25	61.2[170]
128.06	58.7[175]
128.51 ± 0.10	57.78[141]
117.15	38.3[175]
114.70	35.9[175]
115	32.40[10]
113.0	32.2[170]
109.65	28.7[175]
110	27.30[10]
104.39	22.9[175]
105	22.40[10]
102	20[38]
100	18.50[10]
100.00	18.5[175]
100	18.5[3, 60]
98.1	18.3[170]
95	15.50[10]
95.00	15.5[175]
95	15.5[3]
90	12.60[10]
90	12.6[3]
87.47	11.9[175]
87.4	11.9[170]
87.2	11.4[170]
87	10[38]
85	9.80[10]
85	9.8[3]
80	7.40[10]
80	7.4[3]
75	5.43[3]
74	5[38]
70	4[38]
70	3.95[3]
70	3.9[146]
65	2.65[3]
60	1.83[3]
59.76	1.780[238]
55	1.26[3]
55	1[146]
50	0.815[221]
50	0.81[3]
49.94	0.801[238]
44.86	0.526[238]
45	0.518[221]
45	0.51[3]
40	0.35[146]
40	0.320[221]
39.70	0.320[238]
40	0.32[3]

34.60	0.218[238]
35	0.210[221]
35	0.21[3]
35	0.195[153]
30	0.135[3]
30	0.133[221]
29.62	0.128[238]
25	0.103[3]
24.80	0.0845[238]
25	0.082[221]
20	0.080[3]
15	0.062[3]
20	0.06[153]
20	0.0545(b)[10, 37]
20	0.054[221]
19.86	0.0500[238]
10	0.047[3]
15	0.0376(b)[10]
15	0.035[221]
5	0.034[3]
12.98	0.0233[238]
0	0.023(b)[10]
0	0.022[3]
10	0.021[221]
5	0.010[221]
0	0.006[221]
0	0.00538[238]
D_4^{20}	
0.9628_3	**100°**
1.035[120]	
1.036[120]	
1.110[26]	
1.152 (solid)[212]	
1.158 (solid)[215]	
1.172 (solid)[171]	
1.175 (solid)[203]	
0.889	187.8° [217]
0.8962	177.2° [64]
0.912	164.8° [217]
0.9212	152° [122]
0.9400	127.0° [64]
0.9456	120° [68]
0.95040 (b)	115° [147]
0.9632	100.86° [88]
0.9630	100.04° [88]
0.9609	100° [68]
0.96248 (b)	100° [147]
0.9643	99.8° [255]
0.9641	99.6° [256]
0.9645	99.6° [120, 255]
0.9629	99.5° [121]
0.9631	99.3° [121]
0.9630	99.2° [121]
0.9628	$D_0^{99\ 02}$ [4, 5]
0.9634_5 (b)	99.0° [219]
0.96208	98.4° [174]
0.9621	98.4° [33]
1.0056	D_{95}^{95} [195]
0.9696	91.45° [27]
0.9685	90° [68]
0.9696	90° [122]
0.97056 (b)	90° [147]
0.9715	87.29° [88]
0.9757	85.30° [261]
0.9752 ± 0.0002	85° [141]
0.9757	85° [255]
1.0070	D_{85}^{85} [195]
0.9746	84.55° [27]
0.9766 (b)	82.2° [219]
0.97703 (b)	82° [147]
0.9759	81.92° [88]
0.9771	80.76° [88]
0.9790	80° [122]
0.9777	79.9° [72]
0.9778	79.2° [220]
0.9790	78.45° [27]
0.9799	77.35° [27]
0.9813	75.04° [27]
0.9830	72.61° [27]
0.9850	70.10° [27]
0.9877	66.71° [27]
0.9991	50° [68]
1.1675 (solid)	31.51° [27]
1.149	25° [119]
1.1789 (b)	23.9° [87]
1.168	22° [75]
1.170	18° [75]

1.1589 (solid)	17° [59]
1.1708 (solid)	15.71° [27]
1.1517	15° [92]
1.15173	15° [254]
1.1788 (solid)	8.31° [27]
1.0373	0° [68]
1.2355 (solid)	−188° [59]

n_D^{20}

1.5821_4	100°
1.618[120]	
1.619[120]	
1.5330	187.8° [217]
1.5467	164.8° [217]
1.5695	124.8° [217]
1.5760	111.3° [217]
1.58218	99.6° [120, 255]
1.58269	99.6° [256]
1.58291	99.5° [121]
1.58276	99.3° [121]
1.58276	99.2° [121]
1.58232	98.4° [174]
1.58987	85.30° [273]
1.58996	85.30° [261]
1.5898 ± 0.0002	85° [141]
1.5917	82.8° [217]
1.601	80° [83]
1.57472	$n_{H\alpha}^{99.6}$ [120, 255]
1.57509	$n_{H\alpha}^{99.6}$ [256]
1.57535	$n_{H\alpha}^{99.5}$ [121]
1.57524	$n_{H\alpha}^{99.3}$ [121]
1.57520	$n_{H\alpha}^{99.2}$ [121]
1.57456	$n_{H\alpha}^{98.4}$ [174]
1.5746	$n_{H\alpha}^{98.4}$ [33]
1.57375	$n_{H\alpha}^{85}$ [255]
1.60328	$n_{H\beta}^{99.6}$ [120, 255]
1.60378	$n_{H\beta}^{99.6}$ [256]
1.60401	$n_{H\beta}^{99.5}$ [121]
1.60387	$n_{H\beta}^{99.3}$ [121]
1.60386	$n_{H\beta}^{99.2}$ [121]
1.60310	$n_{H\beta}^{98.4}$ [174]
1.62261	$n_{H\gamma}^{99.6}$ [120, 255]
1.62295	$n_{H\gamma}^{99.6}$ [256]

(j)

Additional Data

Crit. Temp. (°C)

474[84]

468.2[78, 85]

468.0[265]

Crit. Pressure (mm Hg)

29,792.0[85]

$$t_m = 79.975 + 0.03614\, p_{atm} - 0.000001187\, p_{atm}^2$$

(1 to 3,500 atm)

$$\frac{1}{T_b} = 0.00326573 - 0.00042695 \log_{10} p_{mm}$$

(900 to 2,150 mm)

$$\frac{1}{T_b} = 0.00324419 - 0.00041936 \log_{10} p_{mm}$$

(300 to 900 mm)

$$\frac{1}{T_b} = 0.00320848 - 0.00040522 \log_{10} p_{mm}$$

(35 to 300 mm)

$$\frac{dD}{dt} = -0.00077163\,[1 + 0.001933\,(t - 100)]/°C$$

(60 to 190°C)

$$\frac{dn}{dt} = -0.0005509/°C$$

(80 to 190°C)

(a) The melting point 81 is found in references 14, 15, 91, 112, 145, 192, 199, 262.

(b) This constant is the average of two or more determinations.

(c) This constant was given as a freezing point in the literature.

(d) The melting point 80.1 is found in references 65, 163, 170, 196, 219, 227, 231, 242, 272.

(e) The melting point 80 is found in references 1, 10, 16, 24, 29, 30, 31, 32, 34, 36, 46, 49, 53, 61, 72, 76, 80, 95, 97, 101, 104, 105, 107, 109, 118, 119, 121, 122, 125, 127, 144, 149, 158, 160, 166, 172, 174, 176, 177, 180, 181, 183, 186, 200, 202, 212, 215, 218, 223, 226, 232, 233, 239, 241, 244, 245, 247, 248, 252, 257, 259, 271, 275, 276, 278, 280, 282.

(f) The melting point 79.5 is found in references 25, 43, 158, 164, 183, 184, 213.

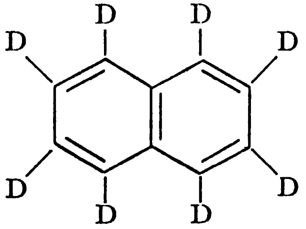
(g) The melting point 79 is found in references 2, 8, 9, 20, 21, 22, 35, 47, 57, 62, 63, 69, 77, 79, 81, 82, 92, 98, 111, 135, 138, 142, 151, 152, 159, 178, 182, 185, 190, 204, 205, 234, 245, 247, 251, 253, 256, 258, 270, 274, 277.

(h) The boiling point 218.05 is found in references 7, 128, 129, 130, 131, 132, 133, 240.

(i) The boiling point 218 is found in references 13, 20, 21, 22, 23, 38, 57, 71, 92, 99, 101, 106, 113, 119, 134, 148, 152, 160, 161, 188, 189, 198, 235, 236, 244, 247, 248, 252, 260, 265, 269.

(j) Refractive indices at other lines are found in reference 173.

Octadeuteronaphthalene



M. P., °C
80–81[50]
77.5[48]

References on Naphthalene

1. Acree, S. F., Am. Chem. J. **29,** 588 **1903.**
2. Acree, S. F., Ber. **37,** 625 **1904.**
3. Allen, R. W., J. Soc. Chem. Ind. **19,** 209 **1900.**
4. Alluard, Ann. **113,** 150 **1860.**
5. Alluard, Ann. chim. phys. [3] **57,** 438 **1859.**
6. Aronheim, B., Ann. **171,** 219 **1874.**
7. Aten, A. H. W., Z. physik. Chem. **78,** 1 **1912.**
8. Bamberger, E., and M. Philip, Ber. **19,** 1995 **1886.**
9. Bamberger, M., and H. von Klimberg, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **126,** Abt. IIb, 325 **1917.**
10. Barker, J. T., Z. physik. Chem. **71,** 235 **1910.**
11. Barus, C., Bull. U. S. Geol. Survey, No. 96, **1892.**
12. Baud, E., Ann. chim. phys. [8] **27,** 89 **1912.**
13. Beckmann, E., and O. Liesche, Z. physik. Chem. **89,** 111 **1915.**
14. Behr, A., and W. A. van Dorp, Ann. **172,** 263 **1874.**
15. Behr, A., and W. A. van Dorp, Ber. **6,** 60 **1873.**
16. Bell, F. K., J. Am. Chem. Soc. **47,** 2811 **1925.**
17. Bennett, G. M., and W. G. Philip, J. Chem. Soc. **1928,** 1937.
18. Berl, E., and A. Kullmann, Ber. **60,** 811 **1927.**
19. Bernoulli, A. L., and P. Lotter, Helv. Chim. Acta **16,** 246 **1933.**
20. Berthelot, Ann. chim. phys. [4] **12,** 1 **1867.**
21. Berthelot, Bull. soc. chim. [2] **7,** 218 **1867.**
22. Berthelot, Bull. soc. chim. [2] **7,** 274 **1867.**
23. Berthelot, Bull. soc. chim. [2] **8,** 226 **1867.**
24. Bhatnagar, S. S., M. R. Verma, and P. L. Kapur, Indian J. Physics **9,** 131 **1934–1935.**
25. Bingham, E. C., and J. E. Hatfield, Physics **6,** 64 **1935.**
26. Blacet, F. E., P. A. Leighton, and E. P. Bartlett, J. Phys. Chem. **35,** 1935 **1931.**

27. Block, H., Z. physik. Chem. **78,** 385 **1912.**

28. Bogoyavlenskiĭ, A., Schriften Dorpater Naturfor. Ges. **13,** 1 **1904;** Chem. Zentr. **1905,** II, 945.

29. Bogoyavlenskiĭ through Tammann, G., "Krystallisieren und Schmelzen," Leipzig, **1903,** p. 45.

30. Bradley, M. J., and S. W. Parr, Chem. & Met. Eng. **27,** 737 **1922.**

31. Brand, K., and K. Trebing, Ber. **56,** 2545 **1923.**

32. Bredt, J., and W. Posth, Ann. **285,** 349 **1895.**

33. Brühl, J. W., Z. physik. Chem **1,** 307 **1887.**

34. Bruni, G., Atti accad. Lincei **13,** II, 373 **1904.**

35. Brunner, H., and R. Brandenburg, Ber. **11,** 697 **1878.**

36. Büchner, E. H., Z. physik. Chem. **54,** 665 **1906.**

37. Bunte, K., and H. Pippig, Gas-u. Wasserfach **66,** 657 **1923.**

38. Burk, F., Gas-u. Wasserfach **67,** 523 **1924.**

39. Burriel, F., Anales soc. españ. fís. quím., **29,** 89 **1931;** C. A. **25,** 2885 **1931;** Chem. Zentr. **1931,** I, 2732.

40. Calcott, W. S., F. L. English, and F. B. Downing, Ind. Eng. Chem. **16,** 27 **1924.**

41. Callendar, H. L., and E. H. Griffiths, Chem. News **63,** 1 **1891.**

42. Callendar, H. L., and E. H. Griffiths, Phil. Trans. **182A,** 119 **1891.**

43. Carnelley, T., J. Chem. Soc. **37,** 701 **1880.**

44. Cauwood, J. D., and W. E. S. Turner, J. Chem. Soc. **107,** 276 **1915.**

45. Charabot, "Les Principes odorants des Végétaux," O. Doin et Fils, Editeurs, Paris, **1912,** pp. 65–67.

46. Chuang, C., Y. Tien, and C. Ma, Ber. **69,** 1494 **1936.**

47. Ciamician, G., Ber. **11,** 269 **1878.**

48. Clemo, G. R., and A. McQuillen, J. Chem. Soc. **1935,** 1325.

49. Clemo, G. R., and J. Ormston, J. Chem. Soc. **1933,** 352.

50. Clemo, G. R., and A. C. Robson, J. Chem. Soc. **1939,** 429.

51. Cohen, E., W. A. T. de Meester, and A. L. T. Moesveld, Rec. trav. chim. **42,** 779 **1923.**

52. Cohen, E., W. A. T. de Meester, and A. L. T. Moesveld, Z. physik. Chem. **108,** 103 **1924.**

53. Coşciug, T., Petroleum **31,** No. 41, 5 **1935.**

54. Crafts, J. M., Bull. soc. chim. [2] **39,** 277 **1883.**

55. Crafts, J. M., J. chim. phys. **11,** 429 **1913.**

56. Dahms, A., Ann. Physik [N.F.] **54,** 486 **1895.**

57. Davis, W. C., J. Soc. Chem. Ind. **33,** 1120 **1914.**

58. DeBeule, P., Bull. soc. chim. Belg. **40,** 195 **1931.**

59. Dewar, J., Chem. News **91,** 216 **1905.**

60. Dodge, B. F., J. Ind. Eng. Chem. **14,** 569 **1922.**

61. Downs, C. R., and A. L. Dean, Ind. Eng. Chem. **6,** 366 **1914.**

62. Dumas, J., Ann. **5,** 5 **1833.**

63. Dumas, J., Ann. chim phys. [2] **50,** 182 **1832.**

64. Dutoit, P., and L. Friederich, Arch. sci. phys. nat. [4] **9,** 105 **1900.**

65. Efremov, N. N., and A. M. Tikhomirova, Ann. inst. anal. phys. chim. (U.S.S.R.) **4,** 92 **1928;** C.A. **23,** 3214 **1929;** Chem. Zentr. **1929,** I, 745.

66. Eppley, M., J. Franklin Inst. **205,** 383 **1928.**

67. Essex, H., Z. anorg. allgem. Chem. **88,** 189 **1914.**

68. Evans, E. B., J. Inst. Petroleum Tech. **24,** 537 **1938.**

69. Falciola, P., Gazz. chim. ital. **52,** I, 175 **1922.**

70. Ferratini, A., and F. Garelli, Gazz. chim. ital. **22,** II, 245 **1892.**

71. Ferrero, P., and J. Corbaz, Helv. Chim. Acta **13,** 1009 **1930.**

72. Fichter, F., and E. Plüss, Helv. Chim. Acta **15,** 236 **1932.**

73. Finck, J. L., and R. M. Wilhelm, J. Am. Chem. Soc. **47,** 1577 **1925.**

74. Flumiani, G., Z. Elektrochem. **32,** 221 **1926.**

75. Forch, C., Ann. Physik [4] **17,** 1012 **1905.**

76. Füchtbauer, C., Z. physik. Chem. **48,** 549 **1904.**
77. Glaser, C., Ann. **135,** 40 **1865.**
78. Goldhammer, D. A., Z. physik. Chem. **71,** 577 **1910.**
79. Goldschmiedt, G., and M. von Schmidt, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **83,** Abt. IIb, 7 **1881.**
80. Gomberg, M., and C. S. Schoepfle, J. Am. Chem. Soc. **41,** 1655 **1919.**
81. Graebe, C., Ann. **163,** 361 **1872.**
82. Graebe, C., and C. Liebermann, Ann. suppl. **7,** 257 **1870.**
83. Grodde, K.-H., Physik. Z. **39,** 772 **1938.**
84. Guldberg, C. M., Z. physik. Chem. **32,** 116 **1900.**
85. Guye, P. A., and E. Mallet, Compt. rend. **133,** 1287 **1901.**
86. Hatcher, W. H., and F. W. Skirrow, J. Am. Chem. Soc. **39,** 1939 **1917.**
87. Hendricks, S. B., and M. E. Jefferson, J. Optical Soc. Am. **23,** 299 **1933.**
88. Heydweiller, A., Ann. Physik [N.F.] **61,** 527 **1897.**
89. Holborn, L., and F. Henning, Ann. Physik [4] **26,** 833 **1908.**
90. Holborn, L., and F. Henning, Ann. Physik [1] **35,** 761 **1911.**
91. Homer, A., Proc. Cambridge Phil. Soc. **16,** 65 **1912.**
92. Hubbard, P., and C. N. Draper, Ind. Eng. Chem. **3,** 903 **1911.**
93. Huffman, H. M., G. S. Parks, and A. C. Daniels, J. Am. Chem. Soc. **52,** 1547 **1930.**
94. Hulett, G. A., Z. physik. Chem. **28,** 629 **1899.**
95. Huntenberg, W., J. prakt. Chem. [2] **145,** 23 **1936.**
96. Ineson, W. J., Gas J. **164,** 835 **1923.**
97. Innes, W. R., J. Chem. Soc. **113,** 410 **1918.**
98. Ipatieff, V. N., and N. Orlov, Ber. **62,** 593 **1929.**
99. Jacobsen, O., Ber. **19,** 1209 **1886.**
100. Jaquerod, A., and E. Wassmer, Ber. **37,** 2531 **1904.**
101. Kaffer, H., Ber. **57,** 1261 **1924.**
102. Kempf, R., J. prakt. Chem. [2] **78,** 201 **1908.**
103. Kendall, J., and K. P. Monroe, J. Am. Chem. Soc. **39,** 1802 **1917.**
104. Kharasch, M. S., and A. L. Flenner, J. Am. Chem Soc. **54,** 674 **1932.**
105. Kidd, Berzelius' Jahresber. **3,** 185 **1824.**
106. Klages, A., and C. Liecke, J. prakt. Chem. [2] **61,** 307 **1900.**
107. Klemm, L., W. Klemm, and G. Schiemann, Z. physik. Chem. **165A,** 379 **1933.**
108. Knoevenagel, E., Ann. **297,** 113 **1897.**
109. Kollarits, M., and V. Merz, Ber. **6,** 536 **1873.**
110. Kopp, H., Ann. **95,** 307 **1855.**
111. Kovache, A., and E. Tricot, Chimie & industrie **13,** 361, 537 **1925.**
112. Kramers, J. G., Ann. **189,** 129 **1877.**
113. Krebs, O., Teer u. Bitumen **27,** 254 **1929.**
114. Kremann, R., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **113,** Abt. IIb, 865 **1904.**
115. Kremann, R., and E. Janetzky, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **121,** Abt. IIb, 709 **1912.**
116. Kremann, R., O. Mauermann, R. Müller II, and W. Rosler, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **131,** Abt. IIb, 273 **1922.**
117. Kremann, R., O. Rodinis, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **114,** Abt. IIb, 1235 **1905.**
118. Krishnan, K. S., Indian J. Phys. **8,** 431 **1934.**
119. Krober, E., Z. physik. Chem. **93,** 641 **1919.**
120. Krollpfeiffer, F., Ann. **430,** 161 **1923.**
121. Krollpfeiffer, F., Ber. **56,** 77 **1923.**
122. Kurnakov, I., D. Krotkov, M. Oksmann, N. Beketov, S. Perelmutter, F. Kanov, and J. Finkel, J. Russ. Phys. Chem. Soc. **47,** 558 **1915;** Z. anorg. allgem. Chem. **135,** 81 **1924.**
123. Küster, F. W., Z. physik. Chem. **8,** 577 **1891.**
124. Lagerlöf, D., J. prakt. Chem. [2] **98,** 136 **1918.**
125. Larsen, R. G., R. E. Thorpe, and F. A. Armfield, Ind. Eng. Chem. **34,** 183 **1942.**

126. Lassettre, E. N., and R. G. Dickinson, J. Am. Chem. Soc. **61,** 54 **1939.**
127. Lautsch, W., Z. physik. Chem. **1B,** 115 **1923.**
128. Lecat, M., Ann. soc. sci. Bruxelles **45,** 169 **1926.**
129. Lecat, M., Ann. soc. sci. Bruxelles **46,** 284 **1926.**
130. Lecat, M., Ann. soc. sci. Bruxelles **47,** 21 **1927.**
131. Lecat, M., Ann. soc. sci. Bruxelles **48B,** 113 **1928.**
132. Lecat, M., Ann. soc. sci. Bruxelles **49B,** 109 **1929.**
133. Lee, H. H., and J. C. Warner, J. Am. Chem. Soc. **57,** 318 **1935.**
134. Leroux, H., Compt. rend. **151,** 384 **1910.**
135. Liebermann, C., and C. Riiber, Ber. **35,** 2696 **1902.**
136. Linard, J., Bull. soc. chim. Belg. **34,** 363 **1925.**
137. Lippmann, A., Z. Elektrochem. **17,** 15 **1911.**
138. Lossen, W., and A. Zander, Ann. **225,** 109 **1884.**
139. Mack, E., Compt. rend. **127,** 361 **1898.**
140. Maillard, A., Ann. combustibles liquides **9,** 1013 **1934.**
141. Mair, B. J., and A. J. Streiff, J. Research Natl. Bur. Standards **24,** 395 **1940.**
142. Majima, R., and C. Kuroda, Acta Phytochim. (Japan) **1,** 43 **1922.**
143. Mameli, E., and A. Mannessier, Gazz. chim. ital. **43,** II, 586 **1913.**
144. Mameli, E., and A. Mossini, Giorn. chim. ind applicata **15,** 161 **1933.**
145. Manzoni-Ansidei, R., Gazz. chim. ital. **67,** 790 **1937.**
146. Marcelin, R., Compt. rend. **158,** 1419 **1914.**
147. Marti, F. B., Bull. soc. chim. Belg. **39,** 590 **1930.**
148. Martin, W. H., and S. Lehrmann, J. Phys. Chem. **27,** 558 **1923.**
149. Marvel, C. S., and A. E. Broderick, J. Am. Chem. Soc. **47,** 3045 **1925.**
150. Mascarelli, L., and V. Babini, Atti accad. Lincei [5] **18,** II, 222 **1909.**
151. Mascarelli, L., and U. Pestalozza, Atti accad. Lincei [5] **16,** II, 567 **1907.**
152. Mascarelli, L., and U. Pestalozza, Gazz. chim. ital. **38,** I, 38 **1908.**
153. Matthews, A., J. Agr. Sci. **14,** 1 **1924.**
154. McVicker, W. H., J. K. Marsh, and A. W. Stewart, J. Chem. Soc. **125,** 1743 **1924.**
155. Mensching, J., and V. Meyer, Z. physik. Chem. **1,** 145 **1887.**
156. Menshutkin, B. N., J. Russ. Phys. Chem. Soç. **44,** 1079 **1912;** C.A. **6,** 3403 **1912.**
157. Merz, V., Z. Chem. [N.F.] **4,** 393 **1868.**
158. Merz, V., and W. Weith, Ber. **10,** 746 **1877.**
159. Merz, V., and W. Weith, Ber. **14,** 187 **1881.**
160. Meyer, R., Ber. **45,** 1609 **1912.**
161. Meyer, R., and H. Fricke, Ber. **47,** 2765 **1914.**
162. Meyer, V., and W. Riddle, Ber. **26,** 2443 **1893.**
163. Michel, J., Bull. soc. chim. Belg. **48,** 105 **1939.**
164. Miers, H. A., and F. Isaac, J. Chem. Soc. **93,** 927 **1908.**
165. Mills, E. J., Phil. Mag. [5] **14,** 1 **1882.**
166. Miolati, A., Z. physik. Chem. **9,** 649 **1892.**
167. Morris, R. E., and W. A. Cook, J. Am. Chem. Soc. **57,** 2403 **1935.**
168. Mortimer, F. S., J. Am. Chem. Soc. **44,** 1416 **1922.**
169. Mortimer, F. S., J. Am. Chem. Soc. **44,** 1429 **1922.**
170. Mortimer, F. S., and R. V. Murphy, Ind. Eng. Chem. **15,** 1140 **1923.**
171. Mukherjee, A., Indian J. Phys. **8,** 147 **1933.**
172. Nametkin, S. S., and L. M. Rosenberg, Bull. acad. sci. U.R.S.S. **1943,** No. 11-12, 3; Survey For. Petrol. Liter. T460, Aug. 18, **1944.**
173. Narasimham, K. L., Indian J. Phys. **6,** 233 **1931.**
174. Nasini, R., and O. Bernheimer, Gazz. chim. ital. **15,** 59 **1885.**
175. Nelson, O., and C. Senseman, Ind. Eng. Chem. **14,** 58 **1922.**
176. Nenhaus, A., Ber. **67,** 1627 **1934.**
177. Nenitzescu, C. D., and E. Cioranescu, Ber. **69,** 1040 **1936.**
178. Norton, L. M., and A. A. Noyes, Am. Chem. J. **8,** 362 **1886.**

179. Noyes, A. A., and C. G. Abbot, Z. physik. Chem. **23,** 56 **1897.**

180. Obreĭmov, I., and A. Prikhot'ko, Physik. Z. Sowjetunion **1,** 203 **1932.**

181. Ogawa, T., and T. Yokota, Bull. Chem. Soc. Japan **5,** 266 **1930.**

182. Orlov, N. A., Ber, **60,** 1950 **1927.**

183. Orlov, N. A., Ber. **62,** 710 **1929.**

184. Orlov, N. A., and M. A. Belopolskiĭ, Ber. **62,** 1226 **1929.**

185. Orlov, N. A., and N. D. Likhachev, Ber. **62,** 719 **1929.**

186. Orlov, N. A., and N. D. Likhachev, Ber. **63,** 2179 **1930.**

187. Orndorff, W. R., and F. K. Cameron, Am. Chem. J. **17,** 517 **1895.**

188. Orndorff, W. R., and F. K. Cameron, Am. Chem. J. **17,** 658 **1895.**

189. Ormandy, W. R., and E. C. Craven, Chem. Trade J. **70,** 41 **1922.**

190. Otto, R. and G. Mórics, Ann. **147,** 164 **1868.**

191. Padoa, M., Atti accad. Lincei [5] **27,** II, 59 **1913.**

192. Padoa, M , Atti accad. Lincei [5] **28,** II, 239 **1919.**

193. Padoa, M., Gazz. chim. ital. **48,** II, 139 **1918.**

194. Parks, G. S., and H. M. Huffman, Ind. Eng. Chem. **23,** 1138 **1931.**

195. Perkin, W. H., J. Chem. Soc. **69,** 1025 **1896.**

196. Piatti, L., Angew. Chem. **45,** 719 **1932.**

197. Pickering, S. U., Proc. Roy. Soc. (London) **49,** 11 **1890–1891.**

198. Pieters, H. A. J., and H. van den Berge, Brennstoff-Chem. **20,** 201 **1939.**

199. Pohl, J., and M. Rawicz, Z. physiol. Chem. **104,** 95 **1919.**

200. Prahl, W., Angew. Chem. **52,** 481 **1939.**

201. Prins, A., Proc Acad. Sci. Amsterdam **19,** 201 **1910.**

202. Pushin, N. A., and B. Vaić, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **135,** Abt. IIb, 503 **1926.**

203. Quercigh, E., Chem. Zentr. **1920,** III, 834.

204. Quinn, E. L., J. Am. Chem. Soc. **50,** 672 **1928.**

205. Raudnitz, H., F. Petru, and F. Haurowitz, Z. physiol. Chem. **209,** 103 **1932.**

206. Reingruber, F., Ann. **206,** 367 **1880.**

207. Reissert, A., Ber. **23,** 2239 **1890.**

208. Rheinboldt, H., J. prakt. Chem. [2] **111,** 242 **1925.**

209. Rheinboldt, H., and M. Kircheisen, J. prakt. Chem. [2] **113,** 199 **1926.**

210. Rhodes, F. H., and F. S. Eisenhauer, Ind. Eng. Chem. **19,** 414 **1927.**

211. Rhodes, F. H., and F. E. Hance, J. Phys. Chem. **25,** 491 **1921.**

212. Robertson, J. M., Proc. Roy. Soc. (London) **142A,** 674 **1933.**

213. Roloff, M., Z. physik. Chem. **17,** 325 **1895.**

214. Rossini, F. D., Petroleum Engineer **14,** No. 5, 41 **1943.**

215. Rudolfi, E., Z. physik. Chem. **66,** 705 **1909.**

216. Ruzicka, L , and C. F. Seidel, Helv. Chim. Acta **19,** 424 **1936.**

217. Salceanu, C., Compt. rend. **194,** 863 **1932.**

218. Sapozhnikov, A., J. Russ. Phys. Chem. Soc. **35,** 1072 **1903**; Z. physik. Chem. **49,** 688 **1904.**

219. Scheuer, O., Z. physik. Chem. **72,** 513 **1910.**

220. Schiff, R., Ann. **223,** 247 **1884.**

221. Schlumberger, E., J. Gasbeleucht. **55,** 1257 **1912.**

222. Schroder, I., Z. physik. Chem. **11,** 449 **1893.**

223. Schultz, G., Ber. **9,** 547 **1876.**

224. Shorygin, P., Ber. **56,** 176 **1923.**

225. Soboleva, V., Z. physik. Chem. **42,** 75 **1902.**

226. Speranskiĭ, A., Z. physik. Chem. **46,** 70 **1903.**

227. Speyers, C. L., J. Am. Chem. Soc. **18,** 146 **1896.**

228. Sunier, A. A., J. Phys. Chem. **34,** 2582 **1930.**

229. Sunier, A., and C. Rosenblum, J. Phys. Chem. **32,** 1049 **1928.**

230. Tammann, G., Ann. Physik [N.F.] **68,** 553 **1899.**

231. Tammann, G., "Krystallisieren und Schmelzen," Leipzig, **1903.**

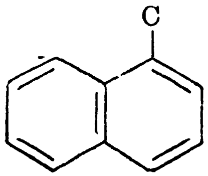
232. Tammann, G., Nachr. Ges. Wiss. Göttingen, Jahresber. Geschäftsjahr, Math. physik. Klasse, Fachgruppen III **1913,** 335.

233. Tammann, G., Z. anorg. allgem. Chem. **157,** 321 **1926.**

234. Tammann, G., and K. L. Dreyer, Z. physik. Chem. Bodenstein-Festband 1 **1931.**
235. Tausson, W. O., Planta **4,** 214 **1927.**
236. Taylor, E. H., and H. S. Taylor, J. Am. Chem. Soc. **61,** 503 **1939.**
237. Terres, E., and W. Vollmer, Petroleum Z. **31,** No. 19, 1 **1935.**
238. Thomas, J S. G., J. Soc. Chem. Ind. **35,** 506 **1916.**
239. Tiffeneau, M., and A. Orékhov, Bull. soc. chim. [4] **27,** 782 **1920.**
240. Timmermans, J., Bull. soc. chim. Belg. **24,** 244 **1910.**
241. Timmermans, J., Bull. soc. chim. Belg. **44,** 17 **1935.**
242. Timmermans, J., and F. Burriel, Compt. rend congr. chim. ind. **10,** 196 **1931.**
243. Timmermans, J , and F. Martin, J. chim. phys. **23,** 733 **1926.**
244. Tishenko, D., J. Russ. Phys. Chem. Soc. **62,** 1407 **1930;** Bull. soc. chim. [4] **47,** 1137 **1930.**
245. Traube, J., A. Kieke, O. Bartsch, and K. Nishizawa, Chem. Ztg. **48,** 633 **1924.**
246. Travers and Gwyer through A. H. W. Aten, Z. physik. Chem. **78,** 1 **1912.**
247. Triebs, W., Ber. **71,** 612 **1938.**
248. Trusty, A. W., Petroleum Refiner **22,** 95 **1943.**
249. U. S. Bur. Standards, Circ. **35,** 3rd ed., July 15, **1918.**
250. U. S. Bur. Standards through M. Eppley, J. Franklin Inst. **205,** 3831 **1928.**
251. van Bijlert, A., Z. physik. Chem. **8,** 341 **1891.**
252. van Liempt, J. A. M., Rec. trav. chim. **57,** 694 **1938.**
253. Versmann, F., Chem. News **30,** 203 **1874.**
254. Vohl, H., J. prakt. Chem. [1] **102,** 29 **1867.**
255. von Auwers, K., Ber. **54,** 3188 **1921.**
256. von Auwers, K., and A. Fruhling, Ann. **422,** 196 **1921.**
257. von Auwers, K., and W. R. Innes, Z. physik. Chem. **18,** 595 **1895.**
258. von Baeyer, A., and W. H. Perkin, Jr., Ber. **17,** 448 **1884.**
259. von Christiani, A. F., and M. Pailer, Mikrochim. Acta **1,** 26 **1937.**
260. von Steiger, A. L., Ber. **53,** 666 **1920.**
261. von Steiger, A. L., Ber. **55,** 1968 **1922.**
262. von Weimarn, N., Kolloid Z. **54,** 296 **1931.**
263. Waidner, C. W., and G. K. Burgess, Chem. News **103,** 25 **1911.**
264. Walden, P., Z. physik. Chem. **65,** 129 **1909.**
265. Walden, P., Z. physik. Chem. **66,** 385 **1909.**
266. Ward, H. L., J. Phys. Chem. **30,** 1316 **1926.**
267. Ward, H., J. Phys. Chem. **38,** 761 **1934.**
268. Washburn, E. W., and J. W. Read, J. Am. Chem. Soc. **41,** 729 **1919.**
269. Weger, M., Z. angew. Chem. **22,** 338 **1909.**
270. Weidel, H., and G. L. Ciamician, Ber. **13,** 65 **1880.**
271. Wichelhaus, H., Ber. **36,** 2942 **1903.**
272. Williams, J. W., and E. F. Ogg, J. Am. Chem. Soc. **50,** 94 **1928.**
273. Willstätter, R., and F. Seitz, Ber. **56,** 1388 **1923.**
274. Willstätter, R., and H. Veraguth, Ber. **40,** 957 **1907.**
275. Windaus, A., and W. Thiele, Ann. **521,** 160 **1935.**
276. Winterstein, A., and K. Schön, Z. physiol. Chem. **230,** 146 **1934.**
277. Wolf, K. L., and H. Weghofer, Z. physik. Chem. **39B,** 194 **1938.**
278. Wright, R., and N. E. Wallace, J. Chem. Soc. **1936,** 1279.
279. Zanetti, J. E., and G. Egloff, Ind. Eng. Chem. **9,** 474 **1917.**
280. Zelinskiĭ, N., Ber. **57,** 264 **1924.**
281. Zelinskiĭ, N., and M. Turova-Pollack, Ber. **58,** 1292 **1925.**
282. Zoppellari, I., Gazz. chim. ital. **35,** I, 355 **1905.**

$C_{11}H_{10}$

1-Methylnaphthalene



M. P., °C

−30.9
−30.77 ± 0.06[19]
−30.90 ± 0.01 (a)[61]
−31[25]
−31.9[19]
−33−−31[67]
−33−−32[20]

B. P., °C @ 760mm

244.74	
244.8[80]	
244.78[19]	
244.78 ± 0.10[61]	
244.6[55]	
244.4[25]	
243–244[16]	
242.5–243.5[40]	
240.4–242.6[35]	
241–242[66, 110]	
244–245	766[20]
243.5–244.1	763[65]
241.5–242	749[77]
151.3 ± 0.2	57.8[61]
148.9	56[19]
145	55[2]
121–123	20[108]
117–120	12–13[56]
108.6–108.8	11[35]
108–109	10[41]
100–105	10[1]
14.6	0.031[60]

D_4^{20}

1.0120	
1.020[25]	
1.0212[112]	
0.9606	100.2°[109]
0.9644	100.1°[112]
0.9604	100.0°[109]
0.9611	100°[25]
0.9632	100.0°[112]
0.9606	99.5°[109]
0.9617	99.4°[109]
0.9771	78.3°[112]
0.9979	50°[25]
1.0163 ± 0.0001	25°[61]
1.0163 ± 0.0002	25°[39]
1.0158	24.7°[107]
1.0181	24.0°[112]
1.0182	23.9°[112]
1.0172	23.3°[109]
1.0170	22.6°[109]
1.0182	21.6°[109]
1.0182	21.3°[109]
1.0190	20.9°[109]
1.0188	20.6°[109]
1.0192	20.5°[109]
1.0192	19.8°[111]
1.0195	19.8°[109]
1.0209	19.7°[112]
1.0211	19.7°[112]
1.0218	19.3°[112]
1.0219	19.2°[112]
1.0218	18.9°[112]
1.02085	18.2°[109]
1.0216	18.2°[112]
1.0223	18.2°[112]
1.0217	17.8°[109]
1.0229	17.6°[112]
1.0212	17.0°[111]
1.0234	17°[41]
1.0225	16.8°[112]
1.0250	14.4°[112]
1.0248	13.6°[110]
1.0259	13.6°[112]
1.0267	11.5°[118]
1.0347	0°[25]

n_D^{20}

1.6157[20]	
1.6167[77]	
1.6172[25]	
1.58077	99.2°[110]
1.5882	40°[116]
1.6140 ± 0.0002	25°[39]
1.6145	25°[25]
1.61494 ± 0.00010	25°[61]
1.6165	18.5°[74]
1.6175	17°[41]
1.6197	15°[25]

1.62124	13.6° [110]
1.57226	$n_{\mathrm{H}\alpha}^{100.2}$ [109]
1.57225	$n_{\mathrm{H}\alpha}^{100.1}$ [112]
1.57226	$n_{\mathrm{H}\alpha}^{100.0}$ [109]
1.57252	$n_{\mathrm{H}\alpha}^{100.0}$ [112]
1.57244	$n_{\mathrm{H}\alpha}^{99.5}$ [109]
1.57235	$n_{\mathrm{H}\alpha}^{99.4}$ [109]
1.57353	$n_{\mathrm{H}\alpha}^{99.2}$ [110]
1.58292	$n_{\mathrm{H}\alpha}^{78.3}$ [112]
1.60677 ± 0.00010	$n_{\mathrm{H}\alpha}^{25}$ [61]
1.60687	$n_{\mathrm{H}\alpha}^{24.7}$ [107]
1.60750	$n_{\mathrm{H}\alpha}^{24.0}$ [112]
1.60754	$n_{\mathrm{H}\alpha}^{23.9}$ [112]
1.60786	$n_{\mathrm{H}\alpha}^{23.3}$ [109]
1.60811	$n_{\mathrm{H}\alpha}^{22.6}$ [109]
1.60846	$n_{\mathrm{H}\alpha}^{21.6}$ [109]
1.60846	$n_{\mathrm{H}\alpha}^{21.3}$ [109]
1.59156	$n_{\mathrm{H}\alpha}^{20.9}$ [109]
1.60881	$n_{\mathrm{H}\alpha}^{20.6}$ [109]
1.60909	$n_{\mathrm{H}\alpha}^{20.5}$ [109]
1.60900	$n_{\mathrm{H}\alpha}^{20.0}$ [112]
1.60919	$n_{\mathrm{H}\alpha}^{19.8}$ [111]
1.60927	$n_{\mathrm{H}\alpha}^{19.8}$ [109]
1.60909	$n_{\mathrm{H}\alpha}^{19.7}$ [112]
1.60944	$n_{\mathrm{H}\alpha}^{19.7}$ [112]
1.60932	$n_{\mathrm{H}\alpha}^{19.3}$ [112]
1.60936	$n_{\mathrm{H}\alpha}^{19.2}$ [112]
1.60980	$n_{\mathrm{H}\alpha}^{18.9}$ [112]
1.60980	$n_{\mathrm{H}\alpha}^{18.2}$ [112]
1.60989	$n_{\mathrm{H}\alpha}^{18.2}$ [112]
1.61007	$n_{\mathrm{H}\alpha}^{18.2}$ [109]
1.61051	$n_{\mathrm{H}\alpha}^{17.8}$ [109]
1.61015	$n_{\mathrm{H}\alpha}^{17.6}$ [112]
1.60997	$n_{\mathrm{H}\alpha}^{17.2}$ [112]
1.61052	$n_{\mathrm{H}\alpha}^{17.0}$ [111]
1.61042	$n_{\mathrm{H}\alpha}^{16.9}$ [112]
1.61051	$n_{\mathrm{H}\alpha}^{16.8}$ [112]
1.61051	$n_{\mathrm{H}\alpha}^{16.7}$ [112]
1.61126	$n_{\mathrm{H}\alpha}^{15.0}$ [112]
1.61130	$n_{\mathrm{H}\alpha}^{14.9}$ [112]
1.61121	$n_{\mathrm{H}\alpha}^{14.4}$ [112]
1.61174	$n_{\mathrm{H}\alpha}^{13.6}$ [112]
1.61300	$n_{\mathrm{H}\alpha}^{13.6}$ [110]
1.60025	$n_{\mathrm{H}\beta}^{100.2}$ [109]
1.60018	$n_{\mathrm{H}\beta}^{100.1}$ [112]
1.60034	$n_{\mathrm{H}\beta}^{100.0}$ [109]
1.60043	$n_{\mathrm{H}\beta}^{99.5}$ [109]
1.60285	$n_{\mathrm{H}\beta}^{99.4}$ [109]
1.60159	$n_{\mathrm{H}\beta}^{99.2}$ [110]
1.63672 ± 0.00010	$n_{\mathrm{H}\beta}^{25}$ [61]
1.63680	$n_{\mathrm{H}\beta}^{24.7}$ [107]
1.63740	$n_{\mathrm{H}\beta}^{24.0}$ [112]
1.63744	$n_{\mathrm{H}\beta}^{23.9}$ [112]
1.63776	$n_{\mathrm{H}\beta}^{23.3}$ [109]
1.63800	$n_{\mathrm{H}\beta}^{22.6}$ [109]
1.63844	$n_{\mathrm{H}\beta}^{21.6}$ [109]
1.63844	$n_{\mathrm{H}\beta}^{21.3}$ [109]
1.61969	$n_{\mathrm{H}\beta}^{20.9}$ [109]
1.63878	$n_{\mathrm{H}\beta}^{20.6}$ [109]
1.63905	$n_{\mathrm{H}\beta}^{20.5}$ [109]
1.63895	$n_{\mathrm{H}\beta}^{20.0}$ [112]
1.63931	$n_{\mathrm{H}\beta}^{19.8}$ [109, 111]
1.63913	$n_{\mathrm{H}\beta}^{19.7}$ [112]
1.63947	$n_{\mathrm{H}\beta}^{19.7}$ [112]
1.63935	$n_{\mathrm{H}\beta}^{19.3}$ [112]
1.63939	$n_{\mathrm{H}\beta}^{19.2}$ [112]
1.63983	$n_{\mathrm{H}\beta}^{18.9}$ [112]
1.64000	$n_{\mathrm{H}\beta}^{18.2}$ [112]
1.64009	$n_{\mathrm{H}\beta}^{18.2}$ [109]
1.64052	$n_{\mathrm{H}\beta}^{17.8}$ [109]
1.64026	$n_{\mathrm{H}\beta}^{17.6}$ [112]
1.64008	$n_{\mathrm{H}\beta}^{17.2}$ [112]
1.64060	$n_{\mathrm{H}\beta}^{17.0}$ [111]
1.64050	$n_{\mathrm{H}\beta}^{16.9}$ [112]
1.64068	$n_{\mathrm{H}\beta}^{16.8}$ [112]

1.64050	$n_{\mathrm{H}\beta}^{16.7}$[112]
1.64143	$n_{\mathrm{H}\beta}^{15.0}$[112]
1.64147	$n_{\mathrm{H}\beta}^{14.9}$[112]
1.64146	$n_{\mathrm{H}\beta}^{14.4}$[112]
1.64214	$n_{\mathrm{H}\beta}^{13.6}$[112]
1.64329	$n_{\mathrm{H}\beta}^{13.6}$[110]
1.62067	$n_{\mathrm{H}\gamma}^{99.2}$[110]
1.65852	$n_{\mathrm{H}\gamma}^{21.6}$[109]
1.65852	$n_{\mathrm{H}\gamma}^{21.3}$[109]
1.66024	$n_{\mathrm{H}\gamma}^{18.2}$[112]
1.66106	$n_{\mathrm{H}\gamma}^{16.8}$[112]
1.66372	$n_{\mathrm{H}\gamma}^{13.6}$[110]
1.5800	$n_{\mathrm{He}}^{100.2}$[109]
1.57990	$n_{\mathrm{He}}^{100.1}$[112]
1.5801	$n_{\mathrm{He}}^{100.0}$[109]
1.58027	$n_{\mathrm{He}}^{100.0}$[112]
1.5803	$n_{\mathrm{He}}^{99.5}$[109]
1.5802	$n_{\mathrm{He}}^{99.4}$[109]
1.59095	$n_{\mathrm{He}}^{78.3}$[112]
1.61527	$n_{\mathrm{He}}^{24.7}$[107]
1.61589	$n_{\mathrm{He}}^{24.0}$[112]
1.61593	$n_{\mathrm{He}}^{23.9}$[112]
1.6162	$n_{\mathrm{He}}^{23.3}$[109]
1.6165	$n_{\mathrm{He}}^{22.6}$[109]
1.6168	$n_{\mathrm{He}}^{21.6}$[109]
1.6168	$n_{\mathrm{He}}^{21.3}$[109]
1.6172	$n_{\mathrm{He}}^{20.9}$[109]
1.6172	$n_{\mathrm{He}}^{20.6}$[109]
1.6174	$n_{\mathrm{He}}^{20.5}$[109]
1.61738	$n_{\mathrm{He}}^{20.0}$[112]
1.61757	$n_{\mathrm{He}}^{19.8}$[111]
1.6176	$n_{\mathrm{He}}^{19.8}$[109]
1.61747	$n_{\mathrm{He}}^{19.7}$[112]
1.61782	$n_{\mathrm{He}}^{19.7}$[112]
1.61770	$n_{\mathrm{He}}^{19.3}$[112]
1.61774	$n_{\mathrm{He}}^{19.2}$[112]
1.61818	$n_{\mathrm{He}}^{18.9}$[112]
1.61836	$n_{\mathrm{He}}^{18.2}$[112]
1.61837	$n_{\mathrm{He}}^{18.2}$[112]
1.61844	$n_{\mathrm{He}}^{18.2}$[109]
1.6188	$n_{\mathrm{He}}^{17.8}$[109]
1.61862	$n_{\mathrm{He}}^{17.6}$[112]
1.61844	$n_{\mathrm{He}}^{17.2}$[112]
1.61898	$n_{\mathrm{He}}^{17.0}$[111]
1.61879	$n_{\mathrm{He}}^{16.9}$[112]
1.61907	$n_{\mathrm{He}}^{16.8}$[112]
1.61888	$n_{\mathrm{He}}^{16.7}$[112]
1.61972	$n_{\mathrm{He}}^{15.0}$[112]
1.61976	$n_{\mathrm{He}}^{14.9}$[112]
1.61985	$n_{\mathrm{He}}^{14.4}$[112]
1.62038	$n_{\mathrm{He}}^{13.6}$[112]

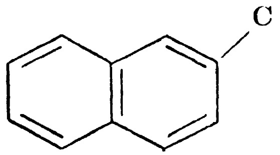
Additional Data

$dD/dt = -0.0007437/°C$

(0 to 50°C)

(a) This constant was given as a freezing point in the literature.

2-Methylnaphthalene



M. P., °C

34.4_4

36.6–37.2[35]

37[27, 36]

35.5[40]

35.1[116]

35[38, 76]

34.5[25, 54, 71]

34.44 ± 0.01 (a)[61]

34.1[43, 75]

34[23, 65]

32.5–33[66]

32–33[73, 106]

32.5[56, 96, 98, 115, 119]

31.5–32.5[110]

32 (b)

B. P., °C @ 760mm

241.1$_4$	
241–243[74]	
242[6]	
241–242[29, 96, 115]	
240–242[5, 74]	
241.14[19]	
241.14 ± 0.05[61]	
241.1[80]	
240–241[121]	
240–242	770[69]
241–242	759[119]
148.07 ± 0.05	57.78[61]
147	50[38]
110–112	16[3]
110.2–111.4	13[35]

D_4^{20}

0.883	174° [93]
0.891	170° [37]
0.912	142.5° [93]
0.930	120° [37]
0.932	111.7° [93]
0.9491	99.4° [110]
0.961	80° [37]
0.9718	70° [25]
0.985	50° [37]
0.99045 ± 0.00002	40° [61]
0.9939	39.9° [110]
1.0043	22° [78]

n_D^{20}

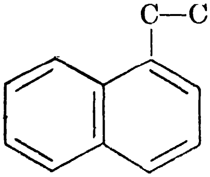
1.528$_6$	174° [93]
1.551	142.5° [93]
1.569$_5$	111.7° [93]
1.5750	99.8° [94]
1.57426	99.4° [110]
1.586$_4$	78.5° [93]
1.5864	78.3° [94]
1.5965	50° [25]
1.599$_7$	49° [93]
1.5997	48.8° [94]
1.6015	40° [25]
1.60192 ± 0.00010	40° [61]
1.6028	40° [116]
1.60263	39.9° [110]
1.605$_6$	34° [93]
1.6056	33.8° [94]
1.56724	$n_{H\alpha}^{99.4}$ [110]
1.59407 ± 0.00010	$n_{H\alpha}^{40}$ [61]
1.59499	$n_{H\alpha}^{39.9}$ [110]
1.59454	$n_{H\beta}^{99.4}$ [110]
1.62306 ± 0.00010	$n_{H\beta}^{40}$ [61]
1.62395	$n_{H\beta}^{39.9}$ [110]
1.64284	$n_{H\gamma}^{39.9}$ [110]

(a) This constant was given as a freezing point in the literature.

(b) The melting point 32 is found in references 5, 15, 16, 63, 97, 103, 118.

$C_{12}H_{12}$

1-Ethylnaphthalene



B. P., °C @ 760mm

258–259[45]	
257–259[120]	
256–259[32]	
257–259.5	757.7[12]
256.5	756[59]
247–249	742[33]
112–116	9[31]
100	2–3[12]

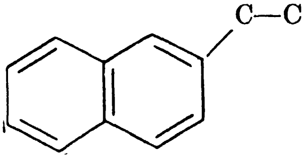
D_4^{20}

1.0123[31]	
1.0111	14.2° [59]
1.0123	$D_0^{11.9}$ [12]
1.0204	D_0^0 [12]
1.0221	D_0^0 [59]

n_D^{20}

1.6075[31]	
1.6089	14.2° [59]

2-Ethylnaphthalene



M. P., °C

−7—−6.5[57]

−7.5[58]

B. P., °C @ 760mm

251.5	
252[52, 58]	
251–252[28, 114]	
250–252[14]	
251[45, 62]	
250–251[9]	
249–254	750[81]
248	725[9]
173–175	50[97]
122–125	14[26]
117–120	12[114]
117–118	10[3]

D_4^{20}

0.9958	15° [57, 58]
1.0015	D_0^{25} [72]
1.0078	0° [62]
1.0069	D_0^0 [57, 58]

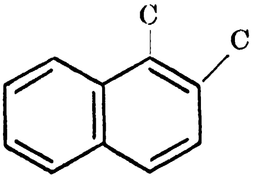
n_D^{20}

1.591	25° [72]
1.6028	15° [57, 58]

(a)

(a) Refractive indices at other lines are found in reference 57.

1,2-Dimethylnaphthalene



M. P., °C

−3.5[22]

B. P., °C @ 760mm

266–267[51]	
265	770[22]
265–266	752[51]
264	749[30]
144	22[110]
148–149	18[95]
139–140	15[95]
135–136	14[42]
137	13[64]
131.5	12[30]
120	0.02[82]

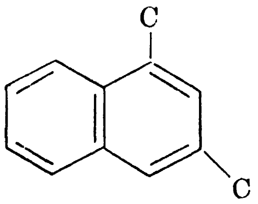
D_4^{20}

1.011[64]	
1.015[51]	
1.019[30]	
1.0118	19.0° [64]
1.025	16.6° [95]
1.0219	16.35° [110]

n_D^{20}

1.6135[51]	
1.6142[64]	
1.61461	19° [64]
1.61795	16.35° [110]
1.60691	$n_{H\alpha}^{19}$ [64]
1.61014	$n_{H\alpha}^{16.35}$ [110]
1.63613	$n_{H\beta}^{19}$ [64]
1.63945	$n_{H\beta}^{16.35}$ [110]
1.65976	$n_{H\gamma}^{16.35}$ [110]

1,3-Dimethylnaphthalene



B. P., °C @ 760mm

248–250[41]	
262–264	746[102]
124–126	10[41]
107	1[4]

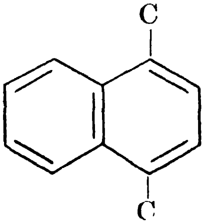
D_4^{20}

1.01997	15°[41]

n_D^{20}

1.6130	15°[41]

1,4-Dimethylnaphthalene



M. P., °C

15–17[102, 105]

5.5–6.5[79]

B. P., °C @ 760mm

264–266[66]	
265[68]	
264[4]	
262–264	751[11]
262.5–263	742[10]
145	40[68]
118	10[79]
110	6[34]

D_4^{20}

1.0157	
1.0157[34]	
0.97411	77.7°[68]
1.01058	27.7°[68]
1.0106	27.7°[7, 8]
1.0176	D_{20}^{20} [34]
1.01803	16.4°[68]
1.0199	12°[11]
1.0283	0°[11]

n_D^{20}

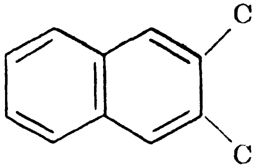
1.58656	77.7°[68]
1.61052	27.7°[68]
1.61567	16.4°[68]
1.57901	$n_{H\alpha}^{77.7}$ [68]
1.60250	$n_{H\alpha}^{27.7}$ [68]
1.6025	$n_{H\alpha}^{27.7}$ [8]
1.60765	$n_{H\alpha}^{16.4}$ [68]
1.60710	$n_{H\beta}^{77.7}$ [68]
1.62200	$n_{H\beta}^{27.7}$ [68]
1.63722	$n_{H\beta}^{16.4}$ [68]
1.65117	$n_{H\gamma}^{27.7}$ [68]

Additional Data

$dD/dt = -0.00072025/°C$

(0 to 78°C)

2,3-Dimethylnaphthalene



M. P., °C

104

104–105[117]

104–104.5[95]

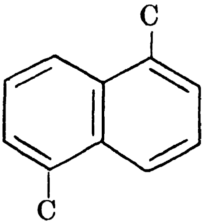
104[4, 122]

102[100]

B. P., °C @ 760mm

265–266	767[48]

1,5-Dimethylnaphthalene



M. P., °C

82[49, 50]

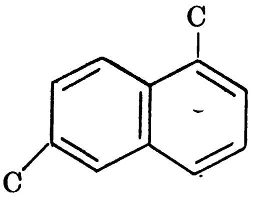
80–80.5[1]

77–78[104]

B. P., °C @ 760mm

265.5[49]	
265–265.5	761[50]

1,6-Dimethylnaphthalene



M. P., °C

97[99]

B. P., °C @ 760mm

262–264[69]
262–263[47, 118]
262.5[13]

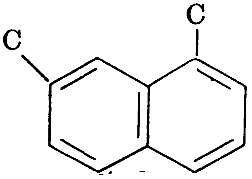
D_4^{20}

1.0049	16.3° [110]
1.0056	15° [118]

n_D^{20}

1.60886	16.3° [110]
1.60119	$n_{H\alpha}^{16.3}$ [110]
1.63021	$n_{H\beta}^{16.3}$ [110]
1.64958	$n_{H\gamma}^{16.3}$ [110]

1,7-Dimethylnaphthalene



M. P., °C

84–85[101]

B. P., °C @ 760mm

261–262[52]	
258[4]	
147–149	15[21]

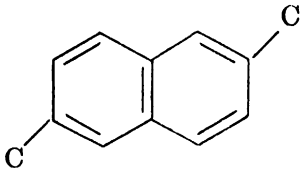
D_4^{20}

1.0115[52]

n_D^{20}

1.60831[52]

2,6-Dimethylnaphthalene



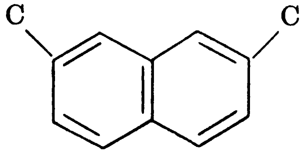
M. P., °C

110.5
113[69]
111[17]
110–111[17, 44, 63, 113, 118]
110.5[40]
110[13, 23, 53]
109[88]

B. P., °C @ 760mm

261–263[44]	
261–262[69]	
260–261	767[48]
261–262	762[118]

2,7-Dimethylnaphthalene



M. P., °C

97
98.5[83]
98[86]
97–98[90]
96.5–97.5[70]
97[46, 83, 89, 97]
96–97[83, 91, 92, 118]
96.5[24]
96[23, 84]
94–95[87]
94[69, 85]

B. P., °C @ 760mm

265[18]	
262	758[118]
128–130	12[85]

References on $C_{11}H_{10}$ through $C_{12}H_{12}$ Compounds

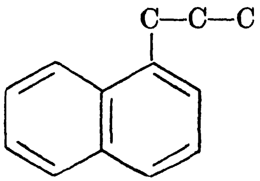
1. Anderson, A. R., and W. F. Short, J. Chem. Soc. **1933,** 485.
2. Arbusov, B. A., and E. V. Kuznetsov, Compt. rend. acad. sci. U.R.S.S. **39,** 343 **1943;** Survey For. Petrol. Liter. Feb. 25, **1944.**
3. Barbot, A., Bull. soc. chim. [4] **47,** 1314 **1930.**
4. Barnett, E. de B., and F. G. Sanders, J. Chem. Soc. **1933,** 434.
5. Bodroux, F., Bull. soc. chim. [3] **25,** 491 **1901.**
6. Bogert, M. T., and V. G. Fourman, J. Am. Chem. Soc. **55,** 4670 **1933.**
7. Brühl, J. W., Ann. **235,** 1 **1886.**
8. Brühl, J. W., Z. physik. Chem. **1,** 307 **1887.**
9. Brunel, O., Ber. **17,** 1179 **1884.**
10. Cannizzaro, S., and A. Andreocci, Gazz. chim. ital. **26,** I, 13 **1896.**
11. Cannizzaro, S., and G. Carnelutti, Gazz. chim. ital. **12,** 393 **1882.**
12. Carnelutti, G., Ber. **13,** 1671 **1880.**
13. Charlampowicz, B., and L. Marchlewski, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1930A,** 376.
14. Ciamician, G., Ber. **11,** 1341 **1878.**
15. Coşciug, T , Petroleum. **31,** No. 41, 5 **1935.**
16. Coşciug, T., Petroleum. **34,** No. 16, 3 **1938.**
17. Coşciug, T., Petroleum. **34,** No. 17, 4 **1938.**
18. Coulson, E. A., J. Chem. Soc. **1935,** 77.
19. Coulson, E. A., J. Soc. Chem. Ind. **60,** No. 5, 123 **1941.**
20. Coulson, E. A., J. Soc. Chem. Ind. **62,** 177T **1943.**
21. Darzens, G., and A. Heinz, Compt. rend. **184,** 33 **1927.**
22. Darzens, G., and A. Levy, Compt. rend. **202,** 73 **1936.**
23. de Laszlo, H. G., Z. physik. Chem. **118,** 369 **1925.**
24. Drake, N. L., and H. M. Duvall, J. Am. Chem. Soc. **58,** 1687 **1936.**
25. Evans, E. B., J. Inst. Petroleum Tech. **24,** 537 **1938.**
26. Fieser, L. F., and M. S. Newman, J. Am. Chem. Soc. **58,** 2376 **1936.**
27. Fittig, R., and L. Liebmann, Ann. **255,** 257 **1889.**
28. Fittig, R., and J. Remsen, Ann. **155,** 112 **1870.**
29. Flegontov, Dissertation through N. A. Orlov, K. F. Protyanova, and V. P. Flegontov, Khim. Tverdogo Topliva **7,** 748 **1936;** Refiner Natural Gasoline Mfr. **17,** 399 **1938.**
30. Fries, K., and A. Küster, Ann. **470,** 20 **1929.**
31. Froschl, N., and J. Harlass, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **140,** Abt. IIb, 703 **1931.**
32. Gilman, H., and R. E. Hoyle, J. Am. Chem. Soc. **44,** 2621 **1922.**
33. Gilman, H., and J. E. Kirby, J. Am. Chem. Soc. **51,** 3475 **1929.**
34. Giovannozzi, G., Gazz. chim. ital. **12,** 147 **1882.**
35. Gockel, H., Z. physik. Chem. **29B,** 79 **1935.**
36. Grimm, H. G., M. Gunther, and H. Tittus, Z. physik. Chem. **14B,** 169 **1931.**
37. Grodde, K.-H., Physik. Z. **39,** 772 **1938.**
38 Grosse, A. V., and V. N. Ipatieff, J. Org. Chem. **2,** 447 **1937.**
39. Grummitt, O., and A. C. Buck, J. Am. Chem. Soc. **65,** 295 **1943.**
40. Hall, C. C., J. Soc. Chem. Ind. **54,** 208 **1935–1936.**
41. Herzenberg, J., and S. Ruhemann, Ber. **60,** 889 **1927.**
42. Hewett, C. L., J. Chem. Soc. **1940,** 293.
43. Huffman, H. M., G. S. Parks, and M. Barmore, J. Am. Chem. Soc. **53,** 3876 **1931.**
44. Kaffer, H., Ber. **57,** 1261 **1924.**
45. Kane, H. L., and A. Lowy, J. Am. Chem. Soc. **58,** 2605 **1936.**
46. Kariyone, T., and A. Nonaka, J. Pharm. Soc. Japan **57,** 20 **1937;** C.A. **33,** 633 **1939;** Chem. Zentr. **1937,** II, 413.
47. Kipping, F. B., and F. Wild, J. Chem. Soc. **1940,** 1239.
48. Kruber, O., Ber. **62,** 3044 **1929.**
49. Kruber, O., Teer u. Bitumen **38,** 13 **1940.**

50. Kruber, O., and A. Marx, Ber. **72,** 1970 **1939.**
51. Kruber, O., and W. Schade, Ber. **68,** 11 **1935.**
52. Kruber, O., and W. Schade, Ber. **69,** 1722 **1936.**
53. Kuhn, R., and A. Winterstein, Ber. **66,** 429 **1933.**
54. Larsen, R. G., R. E. Thorpe, and F. A. Armfield, Ind. Eng. Chem. **34,** 183 **1942.**
55. Lecat, M., Ann. soc. sci. Bruxelles **48B,** 113 **1928.**
56. Lesser, R., Ann. **402,** 1 **1913.**
57. Levy, G., Ann. chim. [11] **9,** 5 **1938.**
58. Levy, G., Compt. rend. **192,** 1397 **1931.**
59. Levy, G., Compt. rend. **193,** 174 **1931.**
60. Linder, E. G., J. Phys. Chem. **35,** 531 **1931.**
61. Mair, B. J., and A. J. Streiff, J. Research Natl. Bur. Standards **24,** 395 **1940.**
62. Marchetti, C., Gazz. chim. ital. **11,** 439 **1881.**
63. Mayer, F., and R. Schiffner, Ber. **67,** 67 **1934.**
64. Mayer, F., and A. Sieglitz, Ber. **55,** 1835 **1922.**
65. McVicker, W. H., J. K. Marsh, and A. W. Stewart, J. Chem. Soc. **127,** 999 **1925.**
66. Meyer, R., and H. Fricke, Ber. **47,** 2765 **1914.**
67. Morgan, G. T., and E. A. Coulson, J. Soc. Chem. Ind. **53,** 73T **1934.**
68. Nasini, R., and O. Bernheimer, Gazz. chim. ital. **15,** 59 **1885.**
69. Nenitzescu, C. D., D. A. Isacescu, and A. C. Isopescu, Oesterr. Chem. Ztg. **42,** 350 **1939.**
70. Noller, C. R., J. Am. Chem. Soc. **56,** 1582 **1934.**
71. Olivier, S. C. J., and J. Wit, Rec. trav. chim. **57,** 90 **1938.**
72. Orlov, N. A., Ber. **60,** 1950 **1927.**
73. Orlov, N. A., and N. D. Likhachev, Ber. **63,** 2179 **1930.**
74. Orlov, N. A., K. F. Protyanova, and V. P. Flegontov, Khim. Tverdogo Topliva **7,** 748 **1936;** Refiner Natural Gasoline Mfr. **17,** 399 **1938.**
75. Parks, G. S., and H. M. Huffman, Ind. Eng. Chem. **23,** 1138 **1931.**
76. Pieters, H. A. J., and H. van den Berge, Brennstoff-Chem. **20,** 201 **1939.**
77. Pokrovskaya, E. S., J. Gen. Chem. (U.S.S.R.) **13,** 579 **1943;** Survey For. Petrol. Liter. T472B, Oct. 20, **1944.**
78. Reingruber, F., Ann. **206,** 367 **1880.**
79. Robinson, R., and H. W. Thompson, J. Chem. Soc. **1932,** 2015.
80. Rossini, F. D., Petroleum Engineer **14,** No. 5, 41 **1943.**
81. Roux, L., Ann. chim. phys. [6] **12,** 289 **1887.**
82. Ruzicka, L., and G. Anner, Helv. Chim. Acta **26,** 129 **1943.**
83. Ruzicka, L., H. Brüngger, R. Egli, L. Ehmann, M. Furter, and H. Hosli, Helv. Chim. Acta **15,** 431 **1932.**
84. Ruzicka, L., H. Brüngger, R. Egli, L. Ehmann, and M. W. Goldberg, Helv. Chim. Acta **15,** 1496 **1932.**
85. Ruzicka, L., L. Ehmann, and E. Morgelli, Helv. Chim. Acta **16,** 311 **1933.**
86. Ruzicka, L., M. Furter, and H. Leuenberger, Helv. Chim. Acta **20,** 312 **1937.**
87. Ruzicka, L., and K. Hofmann, Helv. Chim. Acta **19,** 114 **1936.**
88. Ruzicka, L., K. Hofmann, and J. Frei, Helv. Chim. Acta **19,** 386 **1936.**
89. Ruzicka, L., H. Hosli, and L. Ehmann, Helv. Chim. Acta **17,** 442 **1934.**
90. Ruzicka, L., H. Schellenberg, and M. W. Goldberg, Helv. Chim. Acta **20,** 791 **1937.**
91. Ruzicka, L., F. C. van der Sluys-Veer, and S. L. Cohen, Helv. Chim. Acta **22,** 350 **1939.**
92. Ruzicka, L., F. C. van der Sluys-Veer, and O. Jeger, Helv. Chim. Acta **26,** 280 **1943.**
93. Salceanu, C., Compt. rend. **193,** 161 **1931.**
94. Salceanu, C., Compt. rend. **194,** 863 **1932.**
95. Schroeter, G., L. Lichtenstadt, and D. Irineu, Ber. **51,** 1587 **1918.**
96. Schulze, K. E., Ber. **17,** 842 **1884.**
97. Sengupta, S. C., J. prakt. Chem. [2] **151,** 82 **1938.**
98. Shreve, R. N., and J. H. Lux, Ind. Eng. Chem. **35,** 306 **1943.**

99. Späth, E., F. Wessely, and L. Kornfeld, Ber. **65**, 1536 **1932.**
100. Thiele, W., and G. Trautmann, Ber. **68**, 2245 **1935.**
101. Veselý, V., and A. Medvedeva, Collection Czechoslov. Chem. Commun. **3**, 440 **1931.**
102. Veselý, V., and F. Štursa, Chem. Listy **26**, 495 **1932**; C.A. **27**, 717 **1933**; Chem. Zentr. **1933**, I, 3079.
103. Veselý, V., and F. Štursa, Chem. Listy **29**, 361 **1935**; C.A. **30**, 8202 **1936.**
104. Veselý, V., and F. Štursa, Collection Czechoslov. Chem. Commun. **3**, 430 **1931.**
105. Veselý, V., and F. Štursa, Collection Czechoslov. Chem. Commun. **4**, 139 **1932.**
106. Veselý, V., and F. Štursa, Collection Czechoslov. Chem. Commun. **6**, 137 **1934.**
107. von Auwers, K., Ann. **499**, 123 **1932.**
108. von Auwers, K., Ber. **58**, 151 **1925.**
109. von Auwers, K., and F. Bergmann, Ann. **476**, 272 **1929.**
110. von Auwers, K., and A. Fruhling, Ann. **422**, 196 **1921.**
111. von Auwers, K., and H. Wunderling, Ber. **64**, 2748 **1931.**
112. von Auwers, K., and E. Wolter, Nachr. Ges. Wiss. Gottingen, Math. physik. Klasse, Fachgruppen III, **1931**, 101.
113. von Baeyer, A., Ber. **32**, 2129 **1899.**
114. von Braun, J., E. Hahn, and J. Seeman, Ber. **55**, 1687 **1922.**
115. Weger, M., Z. angew. Chem. **22**, 338 **1909.**
116. Weiss, J. M., and C. R. Downs, Ind. Eng. Chem. **15**, 1022 **1923.**
117. Weissgerber, R., Ber. **52**, 370 **1919.**
118. Weissgerber, R., and O. Kruber, Ber. **52**, 346 **1919.**
119. Wendt, G., J. prakt. Chem. [2] **46**, 317 **1892.**
120. Wertyporch, E., Ber. **64**, 1360 **1931.**
121. Wichelhaus, H., Ber. **24**, 3918 **1891.**
122. Windaus, A , and W. Thiele, Ann. **521**, 160 **1935.**

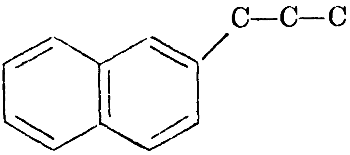
$C_{13}H_{14}$

1-*n*-Propylnaphthalene



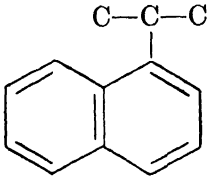
B. P., °C @ 760mm
275–276[61]
274–275[4, 5]

2-*n*-Propylnaphthalene



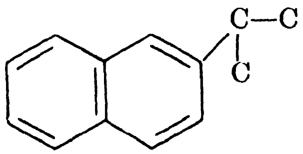
B. P., °C @ 760mm
277–279[4, 5]

1-Isopropylnaphthalene



B. P., °C @ 760mm		
	264–266[9]	
	263–264	769[22]
	132	12[22]
	132–134	10[38, 39]
D_4^{20}		
	0.90075	15° [38]
n_D^{20}		
	1.5728	15° [39]
	1.5775	15° [38]

2-Isopropylnaphthalene



B. P., °C @ 760mm

268[86]	
263–265[22]	
262[86]	
265	755[62]
145	25[62]
129–130	14[2]
125	12[65]
99–100	0.2[8]

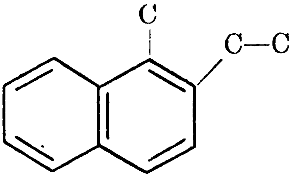
D_4^{20}

0.9795[86]	
0.974	D_{25}^{25} [59]
0.990	0° [62]

n_D^{20}

1.5772[86]	
1.5775[59]	
1.5784[86]	

1-Methyl-2-ethylnaphthalene



B. P., °C @ 760mm

137.5–140	12[45]
140–145	11[15]

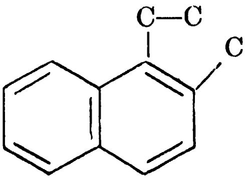
D_4^{20}

1.0014	15.4° [45]

n_D^{20}

1.599[45]	
1.60138	15.4° [45]
1.59422	$n_{H\alpha}^{15.4}$ [45]
1.62151	$n_{H\beta}^{15.4}$ [45]
1.63995	$n_{H\gamma}^{15.4}$ [45]

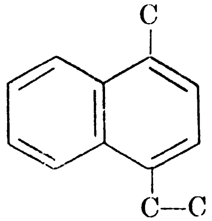
1-Ethyl-2-methylnaphthalene



B. P., °C @ 760mm

135–145	11[15]

1-Methyl-4-ethylnaphthalene



B. P., °C @ 760mm

122	10[30]
138–140	12[45]

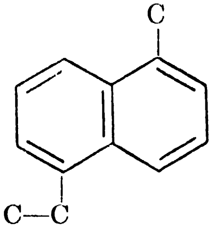
D_4^{20}

1.0086	13.1° [45]

n_D^{20}

1.60571	13.1° [45]
1.59839	$n_{H\alpha}^{13.1}$ [45]
1.62624	$n_{H\beta}^{13.1}$ [45]
1.64490	$n_{H\gamma}^{13.1}$ [45]

1-Methyl-5-ethylnaphthalene



M. P., °C

40[36]

B. P., °C @ 760mm

140	12[77]
133	10[36]

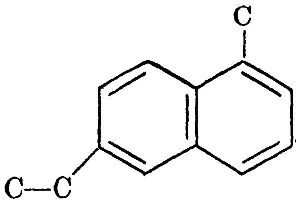
D_4^{20}

1.011	18° [77]

n_D^{20}

1.600	30° [36]
1.6082	18° [77]

1-Methyl-6-ethylnaphthalene



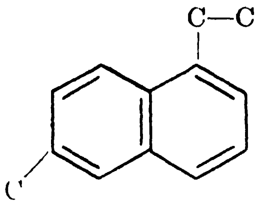
B. P., °C @ 760mm

146	14[58]
140	12[36]

n_D^{20}

1.598[36]

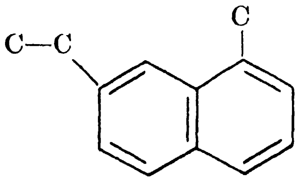
1-Ethyl-6-methylnaphthalene



B. P., °C @ 760mm

135–138	12[14]

1-Methyl-7-ethylnaphthalene



M. P., °C

96–97[20]

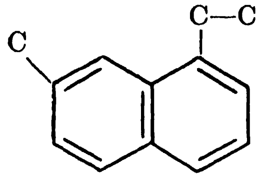
B. P., °C @ 760mm

133–138	16[52]
130–135	16[84]
134.5–136	12[79]
134–136	12[79]
133	12[36]

n_D^{20}

1.5970[36]

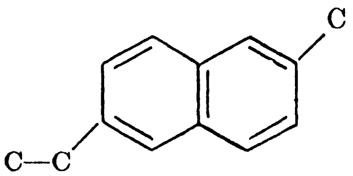
1-Ethyl-7-methylnaphthalene



B. P., °C @ 760mm

128	11[14]

2-Methyl-6-ethylnaphthalene



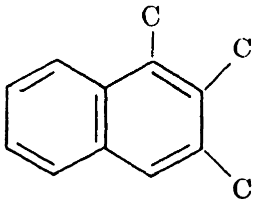
M. P., °C

44–45[44]

B. P., °C @ 760mm

145–150	11[16]

1,2,3-Trimethylnaphthalene



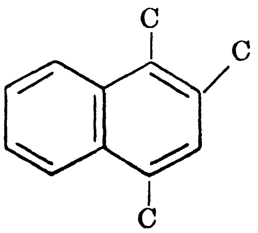
M. P., °C

27–28[40]

B. P., °C @ 760mm

125–130	12[66]

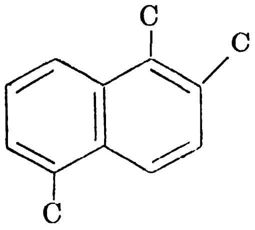
1,2,4-Trimethylnaphthalene



B. P., °C @ 760mm

146	12[66]

1,2,5-Trimethylnaphthalene



M. P., °C

31–32[69]

−5[34]

B. P., °C @ 760mm

148–149	16[70]
147–148	16[70]
147–148	11[69]
101–103	1.5[34]
113–115	0.5[41]
120	0.2[80]

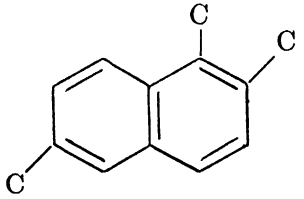
D_4^{20}

1.0103	22°[69]
1.008	15°[70]
1.011	15°[70]

n_D^{20}

1.6093	22°[69]
1.6092	15°[70]
1.6093	15°[70]

1,2,6-Trimethylnaphthalene



M. P., °C

14[87]

B. P., °C @ 760mm

154–156	15[89]
146	10[66]
119–123	10[76]

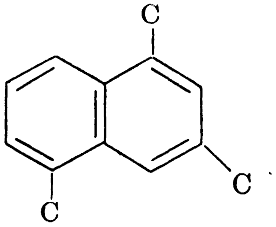
D_4^{20}

0.935[76]

n_D^{20}

1.521[76]

1,3,5-Trimethylnaphthalene



M. P., °C

47[37]

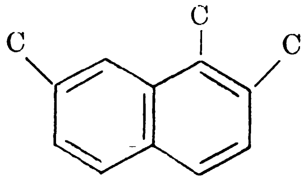
43[66]

B. P., °C @ 760mm

139.5	10[66]

1,2,7-Trimethylnaphthalene

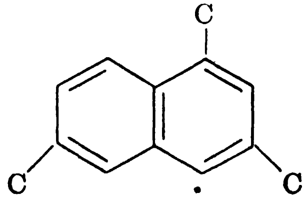
(Sapotalene)



B. P., °C @ 760mm

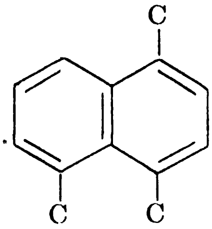
160–163	16[17]
143	13[66]
140–145	12[53]
133	10[18]

1,3,6-Trimethylnaphthalene



B. P., °C @ 760mm
140–144 10[66]

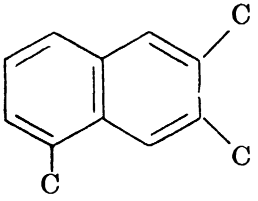
1,4,5-Trimethylnaphthalene



M. P., °C
63[7, 66]

B. P., °C @ 760mm
145 12[66]

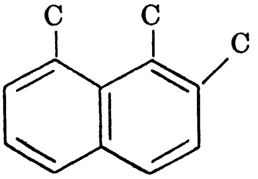
2,3,5-Trimethylnaphthalene



M. P., °C
28[7, 81]
25.3[47]

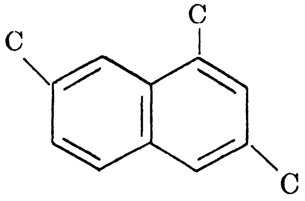
B. P., °C @ 760mm
285[47]
138 12[66]

1,2,8-Trimethylnaphthalene



B. P., °C @ 760mm
150 16[66]

1,3,7-Trimethylnaphthalene



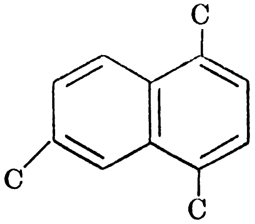
M. P., °C
13.5[46, 48]

B. P., °C @ 760mm
280[18]
280 764[46]
131–133 9[66]

D_4^{20}
1.007[46]
0.9801 21°[66]

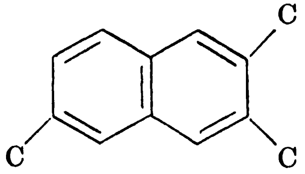
n_D^{20}
1.57589[16]
1.5972 15.5°[66]

1,4,6-Trimethylnaphthalene



B. P., °C @ 760mm
140–142 15[66]

2,3,6-Trimethylnaphthalene

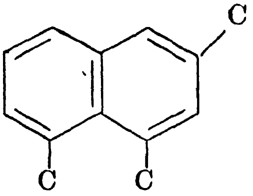


M. P., °C
102[34, 46, 48]
92–93[21, 23]

B. P., °C @ 760mm

286^{48}	
263–264^{21}	
286	762^{46}
146–148	14^{66}
104–105	1.5^{34}

2,4,5-Trimethylnaphthalene

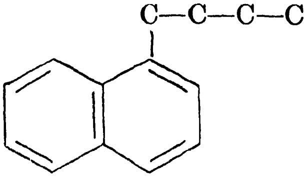


M. P., °C

48^{37}

$C_{14}H_{16}$

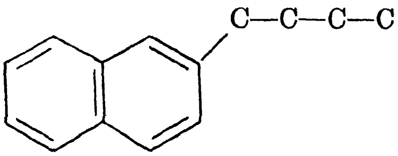
1-*n*-Butylnaphthalene



B. P., °C @ 760mm

281–283^{4,5}

2-*n*-Butylnaphthalene



B. P., °C @ 760mm

283–285^{4,5}	
282.5–283.5	745^{56}
125–130	13^{50}

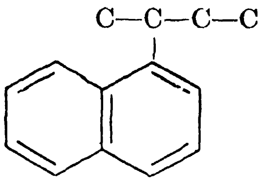
D_4^{20}

0.9659^{56}

n_D^{20}

1.5790^{56}

1-*sec*-Butylnaphthalene



B. P., °C @ 760mm

111–113	2^{86}
105–107	2^{86}

D_4^{20}

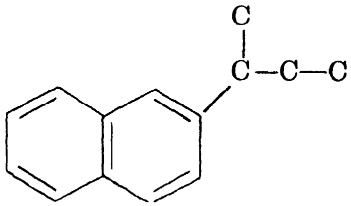
0.9746^{86}

0.9749^{86}

n_D^{20}

1.5698^{86}

2-*sec*-Butylnaphthalene



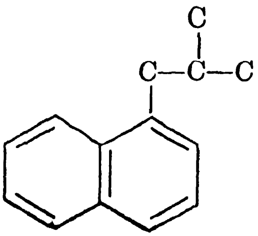
B. P., °C @ 760mm

147–148	33^{8}

n_D^{20}

1.5814^{8}

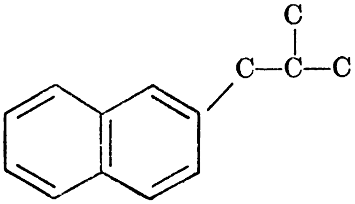
1-Isobutylnaphthalene



B. P., °C @ 760mm

136–138	11^{27}

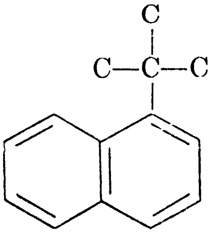
2-Isobutylnaphthalene



B. P., °C @ 760mm

112–113	6[27]

1-*tert*-Butylnaphthalene



B. P., °C @ 760mm

287–289[86]	
114–118	3[49]

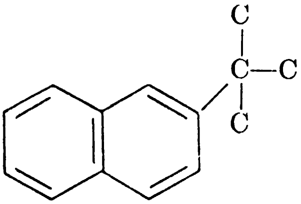
D_4^{20}

0.9629[86]

n_D^{20}

1.5726[86]

2-*tert*-Butylnaphthalene



M. P., °C

−4[90]

B. P., °C @ 760mm

274–276[86]	
274–277	756[13]
272–275	745[56]
137–139	17[13]
145	15[90]
142–143	14[83]
140–145	13[59]
127–131	9[32]
115	6[90]
125	4[13]

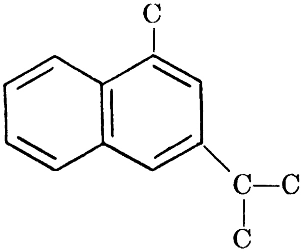
D_4^{20}

0.9674[56]	
09687[86]	
0.979	D_{25}^{25} [59]

n_D^{20}

1.5685[59]
1.5768[86]
1.5795[90]
1.5812[56]

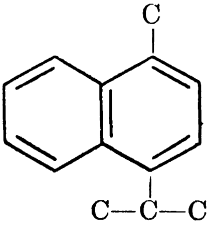
1-Methyl-3-isopropylnaphthalene



B. P., °C @ 760mm

150	11[26]

1-Methyl-4-isopropylnaphthalene



M. P., °C

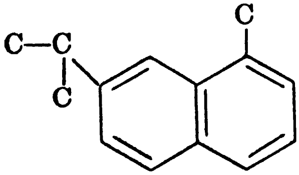
196[30]

B. P., °C @ 760mm

148	16[6]
145–148	12[60]

D_4^{20}	0.9934	14.5° [60]
n_D^{20}	1.5907	14.5° [60]

1-Methyl-7-isopropylnaphthalene
(Eudalene)



B. P., °C @ 760mm

281[7]	
280–281	730[64]
280–281	720[71]
152	18[24]
142–143	12[71]
142	12[71]
140	11[78]

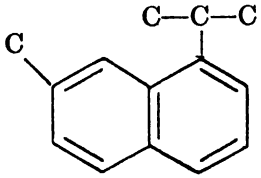
D_4^{20}

0.9734	17°[71]
0.9737	17°[78]
0.9747	16°[71]

n_D^{20}

1.5847	17°[71]
1.5849	17°[78]
1.5850	16°[71]

1-Isopropyl-7-methylnaphthalene
(Apocadalene)



B. P., °C @ 760mm

282[7]	
139–141	12[72]

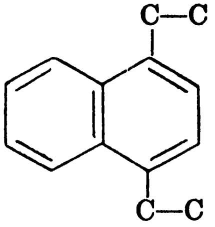
D_4^{20}

0.9833[72]

n_D^{20}

1.5884[72]

1,4-Diethylnaphthalene



M. P., °C

16.5–17[1]

B. P., °C @ 760mm

165	25[1]
150–152.5	12[45]
136–139	9[33]

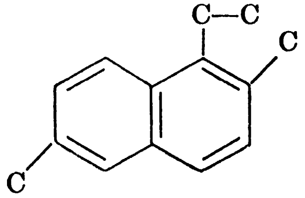
D_4^{20}

0.993[33]	
0.9983	13.1°[45]

n_D^{20}

1.601[33]	
1.59699	13.1°[45]
1.59005	$n_{H\alpha}^{13.1}$ [45]
1.61642	$n_{H\beta}^{13.1}$ [45]
1.63423	$n_{H\gamma}^{13.1}$ [45]

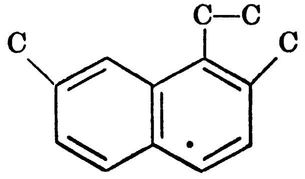
1-Ethyl-2,6-dimethylnaphthalene



B. P., °C @ 760mm

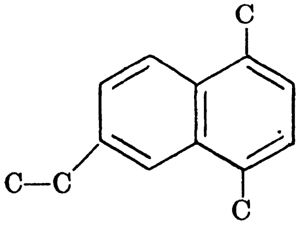
162	23[31]

1-Ethyl-2,7-dimethylnaphthalene



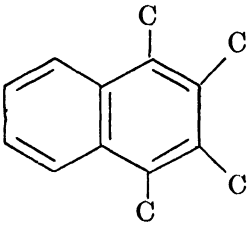
B. P., °C @ 760mm
140–142 12[67]

1,4-Dimethyl-6-ethylnaphthalene



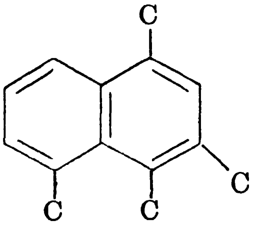
B. P., °C @ 760mm
298–302[35]
115 0.5[68]

1,2,3,4-Tetramethylnaphthalene



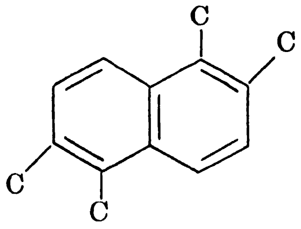
M. P., °C
107–108[57]
106.5–107.5[10]
104–105[12]

1,3,4,5-Tetramethylnaphthalene



B. P., °C @ 760mm
150 10[67]

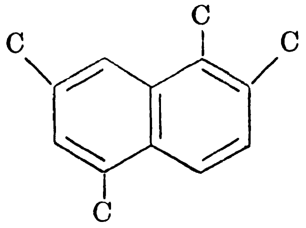
1,2,5,6-Tetramethylnaphthalene



M. P., °C
116.4
118[18]
116–117[53, 74]
116–116.5[67, 74]
116[63]

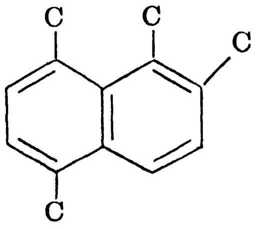
B. P., °C @ 760mm
150–155 12[67]

1,2,5,7-Tetramethylnaphthalene



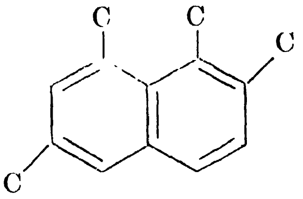
B. P., °C @ 760mm
155–158 12[42]

1,2,5,8-Tetramethylnaphthalene



B. P., °C @ 760mm
150 9[67]

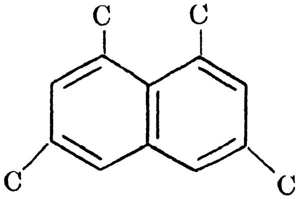
1,2,6,8-Tetramethylnaphthalene



B. P., °C @ 760mm

166–168 15[67]

1,3,6,8-Tetramethylnaphthalene

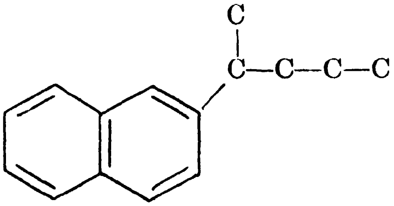


M. P., °C

84–85[85]

$C_{15}H_{18}$

2-(2′-Pentyl)-naphthalene



B. P., °C @ 760mm

130–131 5[49]

1-Isopentylnaphthalene (a)

B. P., °C @ 760mm

287–289[49]

(a) The structure of this compound was not clearly defined in the literature.

2-Isopentylnaphthalene (a)

M. P., °C

108–110[54]

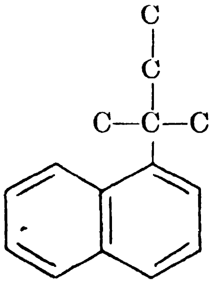
B. P., °C @ 760mm

289–292[54]

140 12[82]

(a) The structure of this compound was not clearly defined in the literature.

1-*tert*-Pentylnaphthalene



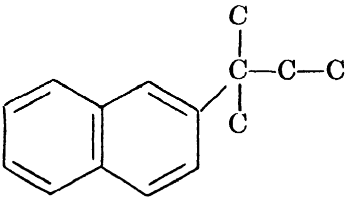
B. P., °C @ 760mm

301–303[86]

D_4^{20}

0.9751[86]

2-*tert*-Pentylnaphthalene



B. P., °C @ 760mm

287–290[86]

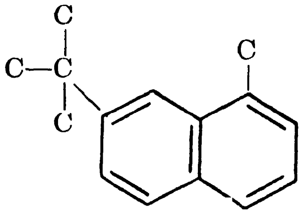
D_4^{20}

0.9751[86]

n_D^{20}

1.5772[86]

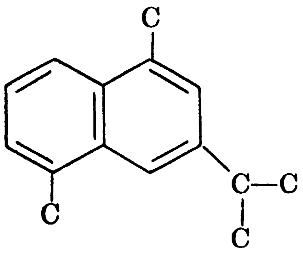
1-Methyl-7-*tert*-butylnaphthalene



B. P., °C @ 760mm

151–152	14[25]

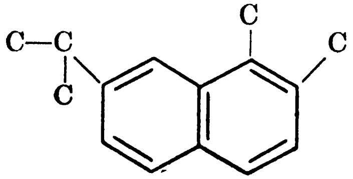
1,5-Dimethyl-3-isopropylnaphthalene



B. P., °C @ 760mm

110–112	0.8[73]

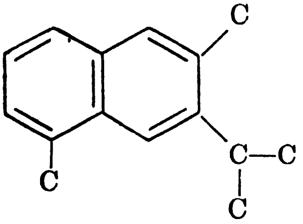
1,2-Dimethyl-7-isopropylnaphthalene



B. P., °C @ 760mm

149–151	9[10]

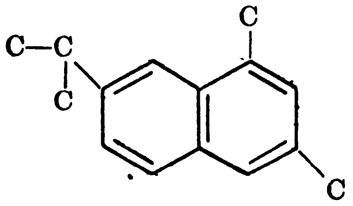
2,5-Dimethyl-3-isopropylnaphthalene



B. P., °C @ 760mm

154–158	13[10]

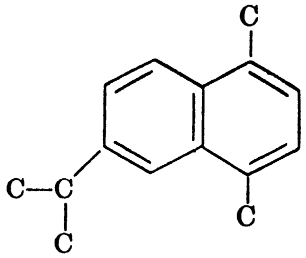
1,3-Dimethyl-7-isopropylnaphthalene



B. P., °C @ 760mm

165–167	19[11]

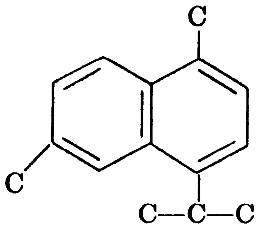
1,4-Dimethyl-6-isopropylnaphthalene



B. P., °C @ 760mm

155–157	12[73]

1,6-Dimethyl-4-isopropylnaphthalene
(Cadalene)



B. P., °C @ 760mm

287–291[43]	
291–292	730[64]
165	20[51]
159.5–164	15[28]
159–163	15[28]
157	15[71]
153–154	15[6]
154–159	13[29]
155–157	12[55]
155–156	11[75]
149	10[3]

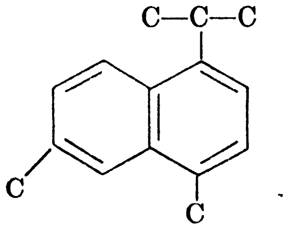
D_4^{20}

0.9731[55]	
0.9716	25° [51]
0.9781	19° [28]
0.9790	19° [28]
0.9798	19° [88]
0.9824	15° [64]

n_D^{20}

1.5820[48]	
1.5834[71]	
1.58491	25° [51]
1.582	19° [75]
1.5850	19° [28]
1.5851	19° [28]
1.5858	15° [88]
1.5869	15° [64]

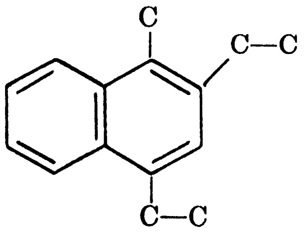
1-Isopropyl-4,6-dimethylnaphthalene



M. P., °C

60[60]

1-Methyl-2,4-diethylnaphthalene



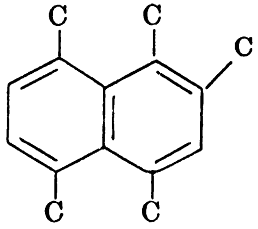
D_4^{20}

0.9870	13.3° [45]

n_D^{20}

1.59231	13.3° [45]
1.58549	$n_{H\alpha}^{13.3}$ [45]
1.61135	$n_{H\beta}^{13.3}$ [45]
1.62870	$n_{H\gamma}^{13.3}$ [45]

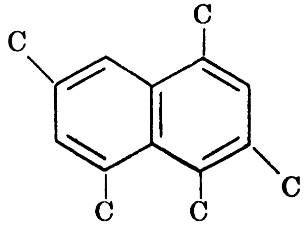
1,2,4,5,8-Pentamethylnaphthalene



B. P., °C @ 760mm

150	10[67]

1,3,4,5,7-Pentamethylnaphthalene



M. P., °C

106–107[67]

B. P., °C @ 760mm

150	10[67]

References on $C_{13}H_{14}$ through $C_{15}H_{18}$ Compounds

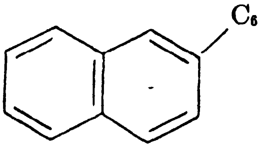
1. Arnold, R. T., and R. A. Barnes, J. Am. Chem. Soc. **66,** 960 **1944.**
2. Barbot, A., Bull. soc. chim. [4] **47,** 1314 **1930.**
3. Bardhan, J. C., and S. K. Banerjee, J. Chem. Soc. **1935,** 476.
4. Bargellini, G., and G. Melacini, Atti accad. Lincei [5] **17,** II, 26 **1908.**
5. Bargellini, G., and G. Melacini, Gazz. chim. ital. **38,** II, 567 **1908.**
6. Barnett, E. de B., and J. W. Cook, J. Chem. Soc. **1933,** 22.
7. Barnett, E. de B., and F. G. Sanders, J. Chem. Soc. **1933,** 434.
8. Bergmann, F., and A. Weizmann, J. Org. Chem. **9,** 352 **1944.**
9. Berry, T. M., and E. E. Reid, J. Am. Chem. Soc. **49,** 3142 **1927.**
10. Bradfield, A. E., B. H. Hedge, B. S. Rao, J. L. Simonsen, and A. E. Gillam, J. Chem. Soc. **1936,** 667.

11. Bradfield, A. E., R. R. Pritchard, and J. L. Simonsen, J. Chem. Soc. **1937,** 760.
12. Briner, E., W. Plüss, and H. Paillard, Helv. Chim. Acta **7,** 1046 **1924.**
13. Bromby, N. G., A. T. Peters, and F. M. Rowe, J. Chem. Soc. **1943,** 144.
14. Brunner, O., and F. Grof, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **142,** Abt. IIb, 682 **1933.**
15. Brunner, O., and F. Grof, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **142,** Abt. IIb, 730 **1933.**
16. Brunner, O., and F. Grof, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **144,** Abt. IIb, 565 **1935.**
17. Brunner, O., H. Hofer, and R. Stein, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **141,** Abt. IIb, 671 **1932.**
18. Brunner, O., H. Hofer, and R. Stein, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **142,** Abt. IIb, 289 **1933.**
19. Clemo, G. R., and H. G. Dickenson, J. Chem. Soc. **1935,** 735.
20. Clemo, G. R., and R. D. Haworth, J. Chem. Soc. **1930,** 2579.
21. Collie, J. N., J. Chem. Soc. **63,** 329 **1893.**
22. Cook, J. W., J. Chem. Soc. **1932,** 456.
23. Coşciug, T., Petroleum. **34,** No. 20, 1 **1938.**
24. Darzens, G., and A. Lévy, Compt. rend. **194,** 2056 **1932.**
25. Darzens, G., and A. Lévy, Compt. rend. **199,** 1126 **1934.**
26. Darzens, G., and A. Lévy, Compt. rend. **201,** 152 **1935.**
27. Darzens, G., and H. Rost, Compt. rend. **146,** 933 **1908.**
28. Deussen, E., J. prakt. Chem. [2] **120,** 119 **1928.**
29. Diels, O., and A. Karstens, Ber. **60,** 2323 **1927.**
30. Dziewoński, K., and M. Marusińska, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1938A,** 316.
31. Dziewoński, K., K. Steo, and P. Zagata, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1938A,** 324.
32. Fieser, L. F., and C. C. Price, J. Am. Chem. Soc. **58,** 1838 **1936.**
33. Frösche, N., and J. Harlass, Monatsh. **59,** 275 **1932.**
34. Gavăt, I., and I. Irimescu, Ber. **75,** 820 **1942.**
35. Gucci, P., and G. Grassi-Cristaldi, Gazz. chim. ital. **22,** I, 1 **1892.**
36. Harvey, J., I. M. Heilbron, and D. G. Wilkinson, J. Chem. Soc. **1930,** 423.
37. Heilbron, I. M., and D. G. Wilkinson, J. Chem. Soc. **1930,** 2537.
38. Herzenberg, J., and S. Ruhemann, Ber. **60,** 889 **1927.**
39. Herzenberg, J., and E. von Winterfeld, Ber. **64,** 1036 **1931.**
40. Hewett, C. L., J. Chem. Soc. **1940,** 293.
41. Hosking, J. R., and C. W. Brandt, Ber. **68,** 37 **1935.**
42. Hosking, J. R., and C. W. Brandt, Ber. **68,** 286 **1935.**
43. Kafuku, K., and N. Ichikawa, Bull. Chem. Soc. Japan **8,** 371 **1933.**
44. Kon, G. A. R., and W. T. Weller, J. Chem. Soc. **1939,** 792.
45. Krollpfeiffer, F., Ann. **430,** 161 **1923.**
46. Kruber, O., Ber. **72,** 1972 **1939.**
47. Kruber, O., Ber. **73,** 1174 **1940.**
48. Kruber, O., Teer u. Bitumen **38,** 13 **1940.**
49. Larsen, R. G., R. E. Thorpe, and F. A. Armfield, Ind. Eng. Chem. **34,** 183 **1942.**
50. Mayer, F., and A. Sieglitz, Ber. **55,** 1835 **1922.**
51. Mousseron, M., R. Granger, and M. Ronayroux, Compt. rend. **208,** 1411 **1939.**
52. Nakamura, H., T. Ohta, and G. Hukuti, Proc Imp. Acad. Tokyo **9,** 91 **1933.**
53. Noller, C. R., J. Am. Chem. Soc. **56,** 1582 **1934.**
54. Oddo, G., and E. Barabini, Gazz. chim. ital. **20,** 719 **1890.**
55. Perrottet, E., W. Taub, and E. Briner, Helv. Chim. Acta **23,** 1260 **1940.**
56. Petrov, A. D., and D. N. Andreev, J. Gen. Chem. (U.S.S.R.) **12,** 95 **1942.**
57. Plüss, W., Helv. Chim. Acta **8,** 507 **1925.**
58. Pope, G. W., and M. T. Bogert, J. Org. Chem. **2,** 276 **1937–1938.**
59. Price, C. C., and J. M. Ciskowski, J. Am. Chem. Soc. **60,** 2499 **1938.**
60. Rapson, W. S., and W. F. Short, J. Chem. Soc. **1933,** 128.
61. Roblin, R., Jr., D. Davidson, and M. T. Bogert, J. Am. Chem. Soc. **57,** 151 **1935.**

62. Roux, L., Ann. chim. phys. [6] **12,** 289 **1887.**
63. Ruhkopf, H., and P. Mohs, Ber. **69,** 1522 **1936.**
64. Ruzicka, L., Fortschr. Chem., Physik u. physik. Chem. **19,** No. 5, 1 **1928.**
65. Ruzicka, L., and E. Capato, Ann. **453,** 62 **1927.**
66. Ruzicka, L., and L. Ehmann, Helv. Chim. Acta **15,** 140 **1932.**
67. Ruzicka, L., L. Ehmann, and E. Morgelli, Helv. Chim. Acta **16,** 314 **1933.**
68. Ruzicka, L., and E. Eichenberger, Helv. Chim. Acta **13,** 1117 **1930.**
69. Ruzicka, L., and J. R. Hosking, Helv. Chim. Acta **13,** 1402 **1930.**
70. Ruzicka, L., H. W. Huyser, M. Pfeiffer, and C. F. Seidel, Ann. **471,** 21 **1929.**
71. Ruzicka, L., J. Meyer, and M. Mingazzini, Helv. Chim. Acta **5,** 345 **1922.**
72. Ruzicka, L., and M. Mingazzini, Helv. Chim. Acta **5,** 710 **1922.**
73. Ruzicka, L , P. Pieth, T. Reichstein, and L. Ehmann, Helv. Chim. Acta **16,** 268 **1933.**
74. Ruzicka, L., H. Schellenberg, and M. W. Goldberg, Helv. Chim. Acta **20,** 791 **1937.**
75. Ruzicka, L., and C. F. Seidel, Helv. Chim. Acta **5,** 369 **1922.**
76. Ruzicka, L., C. F. Seidel, and H. Schinz, Helv. Chim. Acta **16,** 1143 **1933.**
77. Ruzicka, L., R. Steiger, and H. Schinz, Helv. Chim. Acta **9,** 962 **1926.**
78. Ruzicka, L., and M. Stoll, Helv. Chim. Acta **5,** 923 **1922.**
79. Ruzicka, L., and J. A. van Melsen, Helv. Chim. Acta **14,** 397 **1931.**
80. Schmid, L., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **148,** Abt. IIb, 9 **1939.**
81. Schmid, L., and A. Erdös, Ann. **503,** 269 **1933.**
82. Schmid, L., and S. Margulies, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **144,** Abt. IIb, 81 **1935.**
83. Simons, J. H., and S. Archer, J. Am. Chem. Soc. **60,** 2953 **1938.**
84. Tettweiler, K., O. Engel, and E. Wedekind, Ann. **492,** 105 **1932.**
85. Tishenko, D., J. Russ. Phys. Chem. Soc. **62,** 1407 **1930**; Bull. soc. chim. [4] **47,** 1137 **1930.**
86. Tsukervanik, I. P., and I. Terent'eva, J. Gen. Chem. (U.S.S.R.) **7,** 637 **1937;** C. A. **31,** 5780 **1937;** Chem. Zentr. **1938,** I, 578.
87. Veselý, V., and F. Štursa, Collection Czechoslov. Chem. Commun. **4,** 21 **1932.**
88. Vesterberg, R., Svensk Kem. Tid. **37,** 219 **1925.**
89. von Baeyer, A., Ber. **32,** 2429 **1899.**
90. Whitmore, F. C., and W. H. James, J. Am. Chem. Soc. **65,** 2088 **1943.**

$C_{16}H_{20}$

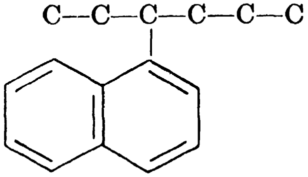
2-Hexylnaphthalene



D_4^{20}
0.9575 25°[11]

n_D^{20}
1.5673 25°[11]

1-(3′-Hexyl)-naphthalene



B. P., °C @ 760mm
148–158 1[18]

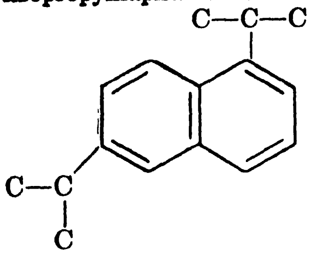
x-Methyl-x-isopentylnaphthalene (a)

B. P., °C @ 760mm
170–172 15[8]

D_4^{20}
0.9607 21.5°[8]

(a) The structure of this compound was not clearly defined in the literature.

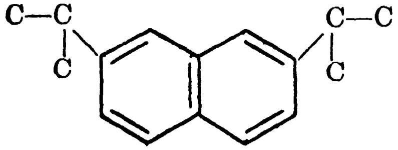
1,6-Diisopropylnaphthalene



M. P., °C

52^{10}

2,7-Diisopropylnaphthalene



B. P., °C @ 760mm

$278–280^{20}$

D_4^{20}

0.9683^{20}

n_D^{20}

1.5701^{20}

---

x,x-Diisopropylnaphthalene (a)

M. P., °C

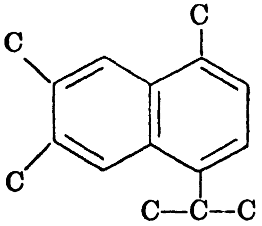
38^{10}

B. P., °C @ 760mm

$317–319^{10}$

(a) The structure of this compound was not clearly defined in the literature.

1,6,7-Trimethyl-4-isopropylnaphthalene



M. P., °C

$39.5–40.0^{3}$

$C_{17}H_{22}$

2-(x'-Naphthyl)-heptane (a)

B. P., °C @ 760mm

162–165 6^{19}

D_4^{20}

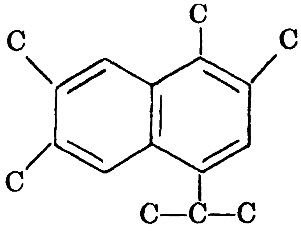
0.933 $26.5°^{19}$

n_D^{20}

1.5448 $24.4°^{19}$

(a) The structure of this compound was not clearly defined in the literature.

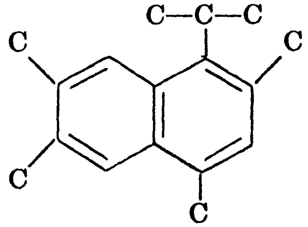
1,2,6,7-Tetramethyl-4-isopropylnaphthalene



M. P., °C

$102–103^{3}$

1-Isopropyl-2,4,6,7-tetramethylnaphthalene



M. P., °C

$96.5–97^{3}$

---

x_4-Tetramethyl-x-isopropylnaphthalene (a)

M. P., °C

111^{5}

(a) The structure of this compound was not clearly defined in the literature.

$C_{18}H_{24}$

x-*n*-Octylnaphthalene (a)

B. P., °C @ 760mm

335–337	750^{14}

D_4^{20}

0.9366^{14}

n_D^{20}

1.5510^{14}

(a) The structure of this compound was not clearly defined in the literature.

x,x-Di-*sec*-butylnaphthalene (a)

B. P., °C @ 760mm

144–145	2^{20}
140–141	2^{20}

D_4^{20}

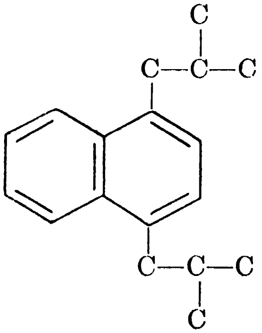
0.9529^{20}
0.9547^{20}

n_D^{20}

1.5596^{20}
1.5601^{20}

(a) The structure of this compound was not clearly defined in the literature.

1,4-Diisobutylnaphthalene



D_4^{20}

0.9310	
0.933^{16}	
0.8784	100° ^{4}
0.9104	50° ^{4}
0.9424	0° ^{9}

n_D^{20}

1.5380	25° ^{16}
1.5410	19° ^{9}

Additional Data

$dD/dt = -0.0006561/°C$
(0 to 100°C)

x,x-Di-*tert*-butylnaphthalene (a)

M. P., °C

148 (b)^{17}
146–147^{1,6}
145–146 (b)^{7}
143^{2}
142^{10}
132^{20}
82–83 (b)^{7}
80–81 (b)^{17}

B. P., °C @ 760mm

320 (b)^{7}	
319 (b)^{7}	
180–185	13^{15}

(a) The structure of this compound was not clearly defined in the literature.

(b) These constants were determined on isomeric forms.

$C_{19}H_{26}$

x,x,x-Triisopropylnaphthalene (a)

B. P., °C @ 760mm

265–270^{15}	
148–152	2^{20}

D_4^{20}

0.9591^{20}	
0.946	D_{25}^{25} ^{15}

n_D^{20}

1.5566^{15}
1.5605^{20}

(a) The structure of this compound was not clearly defined in the literature.

$C_{20}H_{28}$

x,x-Di-*tert*-pentylnaphthalene (a)

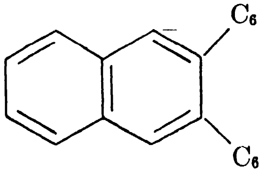
M. P., °C

154–155^{20}

(a) The structure of this compound was not clearly defined in the literature.

$C_{22}H_{32}$

2,3-Dihexylnaphthalene



n_D^{20}

1.5434	25°^{11}

x_4-Tetraisopropylnaphthalene (a)

M. P., °C

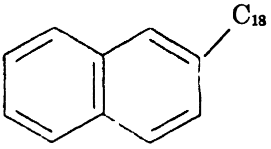
128^{2}

127^{10}

(a) The structure of this compound was not clearly defined in the literature.

$C_{28}H_{44}$

2-Octadecylnaphthalene



M. P., °C

51–52^{11}

D_4^{20}

0.906	25°^{11}
0.912	$D_{15.6}^{15.6}$ ^{13}

n_D^{20}

1.5206 (a)	25°^{11}

(a) This constant is an extrapolated value.

x,x,x-Trihexylnaphthalene (a)

D_4^{20}

0.908	25°^{11}
0.911	25°^{11}
0.914	$D_{15.6}^{15.6}$ ^{13}
0.917	$D_{15.6}^{15.6}$ ^{13}

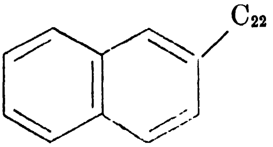
n_D^{20}

1.5276	25°^{11}
1.5297	25°^{11}

(a) The structure of this compound was not clearly defined in the literature.

$C_{32}H_{52}$

2-Docosylnaphthalene



M. P., °C

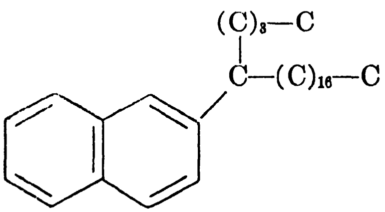
59.77^{13}

56–58^{11}

D_4^{20}

0.8987	25°^{11}
0.905	$D_{15.6}^{15.6}$ ^{13}

5-(2′-Naphthyl)-docosane



M. P., °C

38^{12}

B. P., °C @ 760mm

200–201	2^{12}

D_4^{20}

0.898 (a)	25°^{11}
0.904	$D_{15.6}^{15.6}$ ^{13}

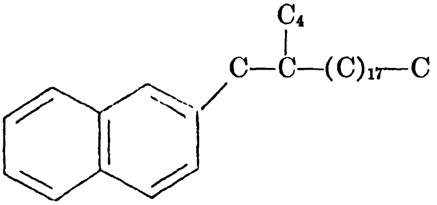
n_D^{20}

1.5170	25° [11]

(a) This constant is an extrapolated value.

$C_{34}H_{56}$

1-(2′-Naphthyl)-2-butyleicosane



D_4^{20}

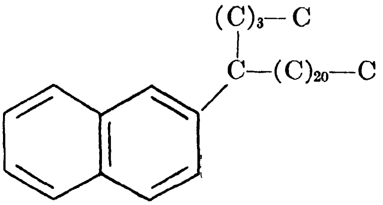
0.9011	25° [11]
0.907	$D_{15.6}^{15.6}$ [13]

n_D^{20}

1.5163	25° [11]

$C_{36}H_{60}$

5-(2′-Naphthyl)-hexacosane



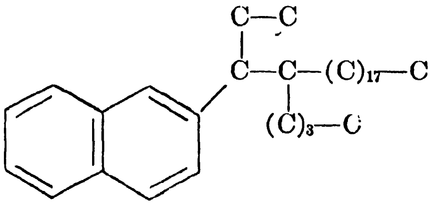
M. P., °C

39[13]

D_4^{20}

0.885	$D_{15.6}^{15.6}$ [13]

3-(2′-Naphthyl)-4-n-butyldocosane



D_4^{20}

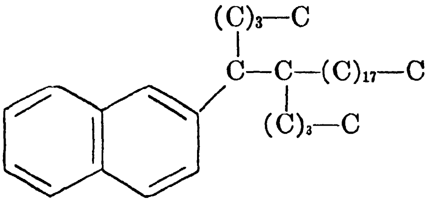
0.8890	25° [11]
0.895	$D_{15.6}^{15.6}$ [13]

n_D^{20}

1.5090	25° [11]

$C_{38}H_{64}$

5-(2′-Naphthyl)-6-n-butyltetracosane



D_4^{20}

0.8918	25° [11]
0.898	$D_{15.6}^{15.6}$ [13]

n_D^{20}

1.5093	25° [11]

References on $C_{16}H_{20}$ through $C_{38}H_{64}$ Compounds

1. Bromby, N. G., A. T. Peters, and F. M. Rowe, J. Chem. Soc. **1943,** 144.
2. Calcott, W. S., J. M. Tinker, and V. Weinmayr, J. Am. Chem. Soc. **61,** 1010 **1939.**
3. Campbell, W. P., and M. D. Soffer, J. Am. Chem. Soc. **64,** 417 **1942.**
4. Evans, E. B., J. Inst. Petroleum Tech. **24,** 537 **1938.**
5. Farmer, E. H., and R. C. Pitkethly, J. Chem. Soc. **1938,** 287.
6. Fieser, L. F., and C. C. Price, J. Am. Chem. Soc. **58,** 1838 **1936.**
7. Gump, W., J. Am. Chem. Soc. **53,** 380 **1931.**
8. Hugel, G., Chimie & industrie **26,** 1282 **1931.**
9. Lerer, M., Ann. combustibles liquides **8,** 681 **1933.**
10. Meyer, H., and K. Bernhauer, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **138,** Abt. IIb, 721 **1929.**
11. Mikeska, L. A., Ind. Eng. Chem. **28,** 970 **1936.**
12. Mikeska, L. A., C. F. Smith, and E. Lieber, J. Org. Chem. **2,** 499 **1938.**
13. Nelson, W. L., Oil Gas J. **35,** No. 44, 46 **1937.**

14. Petrov, A. D., and D. N. Andreev, J. Gen. Chem. (U.S.S.R.) **12,** 95 **1942.**

15. Price, C. C., and J. M. Ciskowski, J. Am. Chem. Soc. **60,** 2499 **1938.**

16. Rossini, F. D., Refiner Natural Gasoline Mfr. **14,** 268 **1935.**

17. Simons, J. H., and S. Archer, J. Am. Chem. Soc. **60,** 2953 **1938.**

18. Spiegler, L., and J. M. Tinker, J. Am. Chem. Soc. **61,** 1002 **1939.**

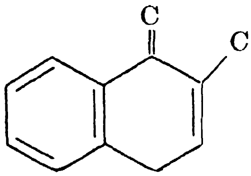
19. Tilicheev, M. D., Khim. Tverdogo Topliva **9,** 181 **1938.**

20. Tsukervanik, I. P., and I. Terent'eva, J. Gen. Chem. (U.S.S.R.) **7,** 637 **1937;** C. A. **31,** 5780 **1937;** Chem. Zentr. **1938,** I, 578.

3. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-12}

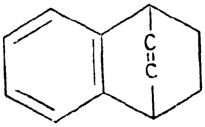
$C_{12}H_{12}$

1-Methylene-2-methyl-1,4-dihydronaphthalene



B. P., °C @ 760mm	
157	15[17]

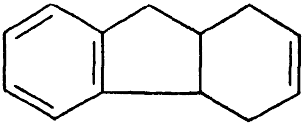
1,4-Endoethene-1,2,3,4-tetrahydronaphthalene



M. P., °C
63.5[32]

$C_{13}H_{14}$

1,4,4a,9a-Tetrahydrofluorene



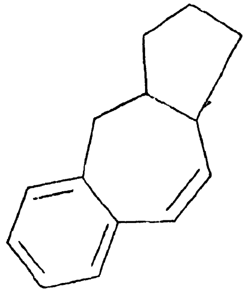
B. P., °C @ 760mm	
121	12[49]
116-118	11[2]

D_4^{20}	
1.018	15° [49]

n_D^{20}
1.58924[49]

$C_{14}H_{16}$

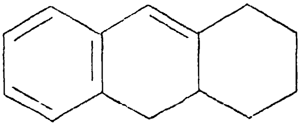
1,2-Cyclopentano-5,6-benzocycloheptene-3



M. P., °C
29-35[16]

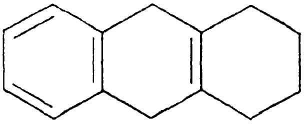
B. P., °C @ 760mm	
130-135	1[16]

1,2,3,4,4a,10-Hexahydroanthracene



M. P., °C
63-66[16]

1,2,3,4,9,10-Hexahydroanthracene



M. P., °C

66.5$^{23, 24, 25, 46}$
63^{33}
62–63^{36}
60–62^{9}

B. P., °C @ 760mm

303–306$^{23, 24, 25}$

---

x$_6$-Hexahydroanthracene (a)

M. P., °C

78^{50}
70^{54}
63^{26}

B. P., °C @ 760mm

290^{26}

(a) The structure of this compound was not clearly defined in the literature.

---

x$_6$-Hexahydrophenanthrene (a)

M. P., °C

−3^{7}

B. P., °C @ 760mm

305–307$^{7, 8}$	
289–290	737^{43}
179–180	23^{19}
165–167	13^{7}
125–126	2.5^{13}

D_4^{20}

1.045^{43}	
1.043	15° ^{7}
1.053	0° ^{7}

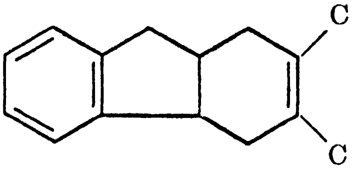
n_D^{20}

1.5704^{43}	
1.586	15° ^{7}
1.5810	14.5° ^{13}

(a) The structure of this compound was not clearly defined in the literature.

$C_{15}H_{18}$

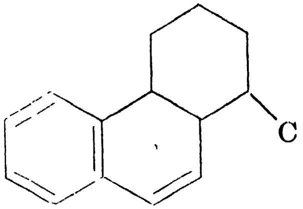
2,3-Dimethyl-1,4,4a,9a-tetrahydrofluorene



B. P., °C @ 760mm

146–148	11^{2}

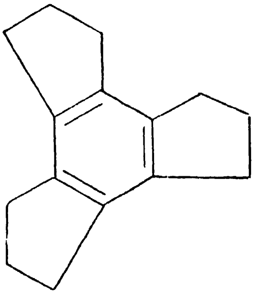
1-Methyl-1,2,3,4,4a,10a-hexahydrophenanthrene



B. P., °C @ 760mm

124	0.3^{27}

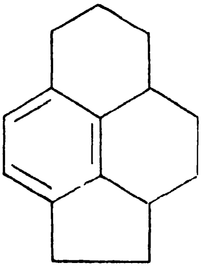
4,5,6,7-Dicyclopentanoindane



M. P., °C

97^{41}

Cyclopentano-[gh]-3a,4,5,6-tetrahydrophenalan

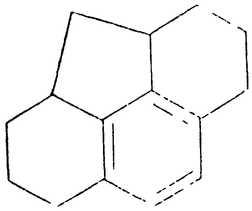


M. P., °C
29[58]

B. P., °C @ 760mm

130–132	12[58]

Cyclopentano-[def]-1,2,3,4,5,6,7,8-octahydrophenanthrene



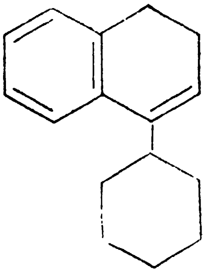
M. P., °C
47[58]

B. P., °C @ 760mm

238[58]	
130-132	15[58]

$C_{16}H_{20}$

4-Cyclohexyl-1,2-dihydronaphthalene



B. P., °C @ 760mm

172	10[14]
140	1[14]

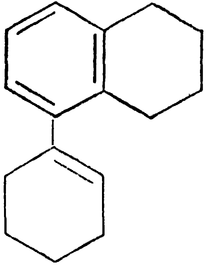
D_4^{20}

1.021	12.2° [14]

n_D^{20}

1.5762	12.2° [14]

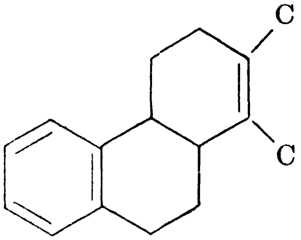
5-(Cyclohexen-1′-yl)-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

181	15[14]

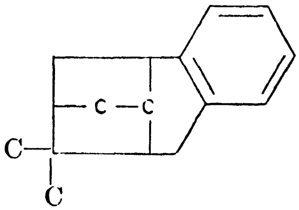
1,2-Dimethyl-3,4,4a,9,10,10a-hexahydrophenanthrene



B. P., °C @ 760mm

105–107	0.02[6]

2,3-Benzo-6,6-dimethyltricyclo-[3,2,1,1^{7,9}]-decane (a)

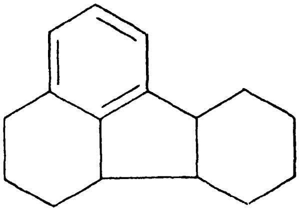


B. P., °C @ 760mm

	121.5–122.5	5[3]
	110.5–111	0.3[3]
D_4^{20}	1.0192	D_0^{16} [3]
n_D^{20}	1.5540	16° [3]

(a) The structure of this compound was not clearly defined in the literature.

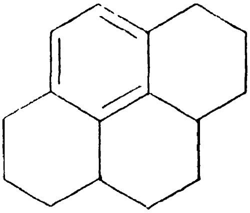
Benzo-[jk]-1,2,3,4,4a,4b,5,6,7,9a-decahydrofluorene



B. P., °C @ 760mm
174–176 13[57]
181–183 12[57]

D_4^{20}
1.0207 29° [57]
1.043 22° [57]

1,2,3,3a,4,5,5a,6,7,8-Decahydropyrene



M. P., °C
34[58]

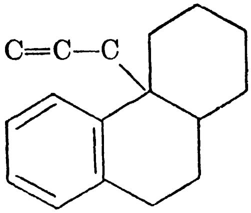
B. P., °C @ 760mm
160 5[35]

D_4^{20}
1.0612[58]
1.0553 25° [35]

n_D^{20}
1.5806[58]
1.5782 25° [35]

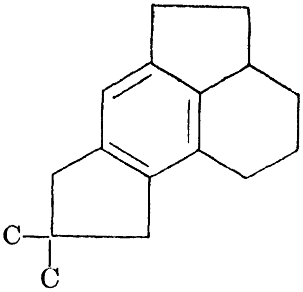
$C_{17}H_{22}$

4a-(Propen-2′-yl)-1,2,3,4,4a,9,10,10a-octahydrophenanthrene



B. P., °C @ 760mm
118 0.2[28]

6,7-(4′,4′-Dimethylcyclopentano)-2a,3,4,5-tetrahydroacenaphthene

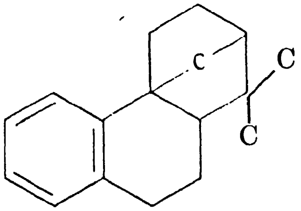


B. P., °C @ 760mm
173–175 13[21]

D_4^{20}
0.9884 22° [21]

n_D^{20}
1.5399 22° [21]

1,1-Dimethyl-2,4a-endomethylene-1,2,3,4,4a,9,10,10a-octahydrophenanthrene (a)



B. P., °C @ 760mm
132.5–133.5 1[8]

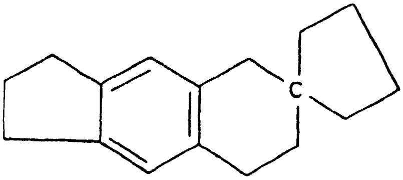
D_4^{20}
1.0252 D_0^{19} [8]

n_D^{20}

1.5578 19°[3]

(a) The structure of this compound was not clearly defined in the literature.

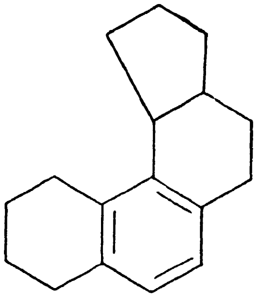
Spiro[6,7-cyclopentano-1,2,3,4-tetrahydronaphthalene-2,1'-cyclopentane]



M. P., °C

64-65[48]

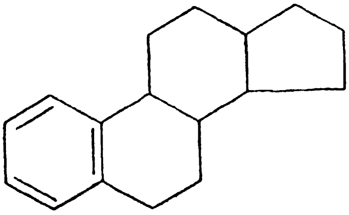
3,4-Cyclopentano-1,2,3,4,5,6,7,8-octahydrophenanthrene



B. P., °C @ 760mm

172-173 5[37]

1,2-Cyclopentano-1,2,3,4,4a,9,10,10a-octahydrophenanthrene

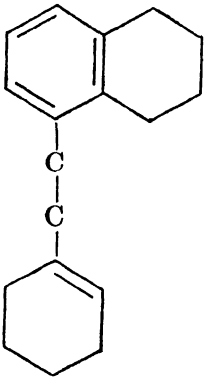


B. P., °C @ 760mm

201 16[30]

$C_{18}H_{24}$

5-[2'-(Cyclohexen-1''-yl)-ethyl]-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

140-150 0.05[10]

1-Methyl-7-isopropyl-x_6-hexahydrophenanthrene (a)

B. P., °C @ 760mm

355[38]

175-177 10[1, 53]

D_4^{20}

0.9802[1, 53]

0.997[38]

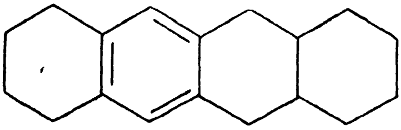
n_D^{20}

1.54705[1, 53]

1.54770[53]

(a) The structure of this compound was not clearly defined in the literature.

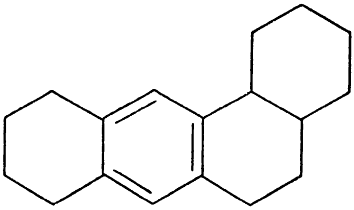
1,2,3,4,4a,5,7,8,9,10,12,12a-Dodecahydronaphthacene



M. P., °C

82-83[55]

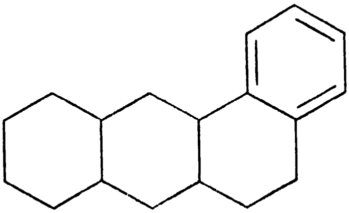
1,2-Cyclohexano-1,2,3,4,5,6,7,8-octahydroanthracene



M. P., °C

87–88[4]

1,2-Benzododecahydroanthracene



M. P., °C

87–88[11]

71–72[4, 12]

71[16]

68–70[15]

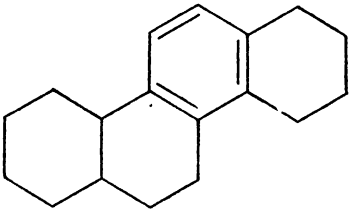
Dodecahydro-x,x-benzoanthracene (a)

D_4^{20}

1.123[31]

(a) The structure of this compound was not clearly defined in the literature.

1,2,3,4,5,6,6a,7,8,9,10,10a-Dodecahydrochysene



M. P., °C

93–94[39]

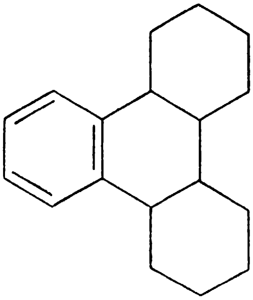
83–84[40]

55–57[56]

B. P., °C @ 760mm

224–226	12[56]

1,2,3,4,4a,4b,5,6,7,8,8a,12b-Dodecahydrotriphenylene



B. P., °C @ 760mm

200–201.5	20[44]

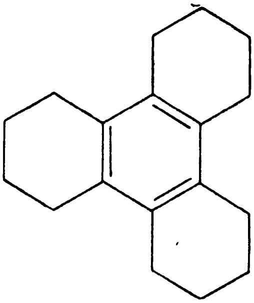
D_4^{20}

0.9468	19.2° [44]

n_D^{20}

1.50432	$n_{H\alpha}^{20}$ [44]
1.51382	$n_{H\beta}^{20}$ [44]
1.5959	$n_{H\gamma}^{20}$ [44]
1.50693	n_{He}^{20} [44]

1,2,3,4,5,6,7,8,9,10,11,12-Dodecahydrotriphenylene



M. P., °C

232

232–233[18, 34, 45, 59]

232[5]

231–232[59]

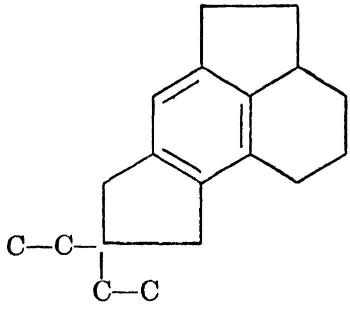
226–228[52]
226[51]

D_4^{20}

1.141	0° [60]
1.148	0° [60]

$C_{19}H_{26}$

6,7-(4',4'-Diethylcyclopentano)-2a,3,4,5-tetrahydroacenaphthene



B. P., °C @ 760mm

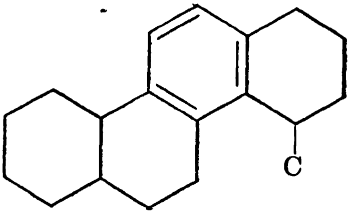
190–195	16[21, 22]

4-Methyldodecahydro-1,2-benzoanthracene (a)

M. P., °C
92.5–93.5[17]

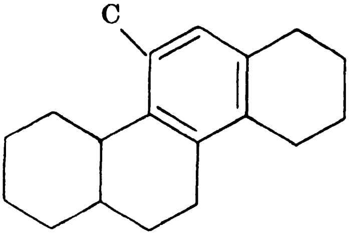
(a) The structure of this compound was not clearly defined in the literature.

4-Methyl-1,2,3,4,5,6,6a,7,8,9,10,10a-dodecahydrochrysene



M. P., °C
87–87.5[40*]

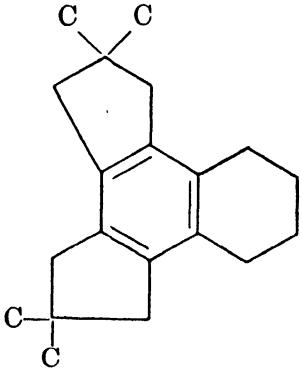
11-Methyl-1,2,3,4,5,6,6a,7,8,9,10a-dodecahydrochrysene



M. P., °C
98.8–99.8[20]

$C_{20}H_{28}$

5,6,7,8-Di-(4',4'-dimethylcyclopentano)-1,2,3,4-tetrahydronaphthalene



M. P., °C
105–106[21, 22]

$C_{22}H_{32}$

x,x-Dicyclohexyl-1,2,3,4-tetrahydronaphthalene (a)

M. P., °C
−4[42]

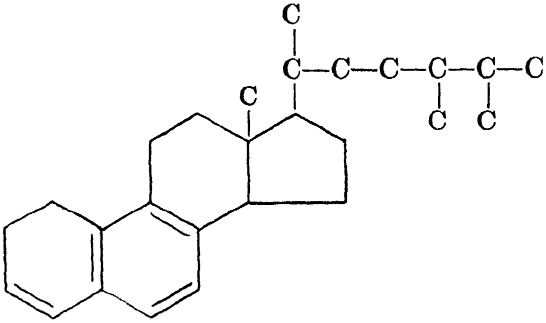
B. P., °C @ 760mm

	198–203	3[42]
D_4^{20}	0.9978	40° [42]
	1.0145	D_{15}^{15} [42]
n_D^{20}	1.5618[42]	
	1.5548	40° [42]

(a) The structure of this compound was not clearly defined in the literature.

$C_{26}H_{40}$

1,2-[3′-(5″,6″-Dimethyl-*sec*-heptyl)-cyclopentano]-2-methyl-1,2,3,4,5,6-hexahydrophenanthrene
(Neoergostatetraene)



M. P., °C
63–64[29]

References on Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-12}

1. Adelson, D. E., and M. T. Bogert, Chem. Revs. **24,** 135 **1939.**
2. Alder, K., and H. F. Rickert, Ber. **71,** 379 **1938.**
3. Arbusov, B. A., J. Gen. Chem. (U.S.S.R.) **9,** 239 **1939;** Chem. Zentr. **1939,** II, 1284.
4. Bachmann, W. E., J. W. Cook, A. Dansi, C. G. M. de Worms, G. A. D. Haslewood, C. L. Hewett, and A. M. Robinson, Proc Roy. Soc. **123B,** 343 **1937.**
5. Bergmann, E., and O. Blum-Bergmann, J. Am. Chem. Soc. **59,** 1441 **1937.**
6. Bergmann, E., and A. Weizmann, J. Org. Chem. **4,** 266 **1939.**
7. Breteau, P., Compt. rend. **140,** 942 **1905.**
8. Brissemoret, A., and A. Joanin, Compt. rend. **151,** 1151 **1910.**
9. Clemmensen, E., Ber. **47,** 681 **1914.**
10. Cohen, A., J. W. Cook, and C. L. Hewett, J. Chem. Soc. **1935,** 1633.
11. Cook, J. W., and G. A. D. Haslewood, J. Chem. Soc. **1935,** 767.
12. Cook, J. W., and C. L. Hewett, J. Chem. Soc. **1934,** 365.
13. Cook, J. W., C. L. Hewett, and C. A. Lawrence, J. Chem. Soc. **1936,** 71.
14. Cook, J. W., and C. A. Lawrence, J. Chem. Soc. **1936,** 1431.
15. Cook, J. W., and C. A. Lawrence, J. Chem. Soc. **1937,** 817.
16. Cook, J. W., N. A. McGinnis, and S. Mitchell, J. Chem. Soc. **1944,** 286.
17. Cook, J. W., A. M. Robinson, and F. Gouldon, J. Chem. Soc. **1937,** 393.
18. Favorskiĭ, A., and V. Boshovskiĭ, Ann. **390,** 122 **1912.**
19. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **57,** 2192 **1935.**
20. Fieser, L. F., and L M. Joshel, J. Am. Chem. Soc. **62,** 1211 **1940.**
21. Fleischer, K , and F. Siefert, Ann. **422,** 272 **1921.**
22. Fleischer, K., and F. Siefert, Ber. **53,** 1255 **1920.**
23. Godchot, M., Ann. chim. phys. [8] **12,** 468 **1907.**
24. Godchot, M., Bull. soc. chim. [4] **1,** 710 **1907.**
25. Godchot, M., Compt. rend. **142,** 1202 **1906.**
26. Graebe, C., and C. Liebermann, Ann. suppl. **7,** 257 **1870.**
27. Grewe, R., Ber. **72,** 785 **1939.**
28. Grewe, R., Ber. **76,** 1072 **1943.**
29. Haslewood, G. A. D., and E. Roe, J. Chem. Soc. **1935,** 465.
30. Hawthorne, J. R., and R. Robinson, J. Chem. Soc. **1936,** 763.
31. Iball, J., Chemistry & Industry **1935,** 716; C.A. **29,** 7737 **1935.**
32. Kasanskiĭ, B. A., and L. G. Vol'fson, J.

Gen. Chem. (U.S.S.R.) **8,** 1685 **1938;** C.A. **33,** 4966 **1939.**
33. Liebermann, C., Ann. **212,** 1 **1882.**
34. Mannich, C., Ber. **40,** 153 **1907.**
35. Matsuno, K., and K. Han, Bull. Chem. Soc. Japan **11,** 321 **1936.**
36. Meyer, H., R. Bondy, and A. Eckert, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **121,** Abt. IIb, 1011 **1912.**
37. Nenitzescu, C. D., E. Ciorănescu, and M. Maican, Ber. **74,** 687 **1941.**
38. Olsson, J., Ing. Vetenskaps Akad., Handl. **1931,** No. 111.
39. Peak, D. A., and R. Robinson, J. Chem. Soc. **1936,** 759.
40. Peak, D. A., and R. Robinson, J. Chem. Soc. **1937,** 1581.
41. Perkin, W. H., Jr., and S. G. P. Plant, J. Chem. Soc. **127,** 1138 **1925.**
42. Pokrovskaya, E. S., and T. G. Stepanseva, J. Gen. Chem. (U.S.S.R.) **9,** 1953 **1939.**
43. Schmidt, J., and R. Mezger, Ber. **40,** 4240 **1907.**
44. Schrauth, W., Z. angew. Chem. **36,** 571 **1923.**
45. Schroeter, G., Ber. **57,** 1990 **1924.**
46. Schroeter, G., Ber. **57,** 2003 **1924.**
47. Schroeter, G., L. Lichtenstadt, and D. Irineu, Ber. **51,** 1587 **1918.**
48. Sen-Gupta, Science and Culture **3,** 56 **1937;** C.A. **31,** 7868 **1937;** Chem. Zentr. **1938,** I, 4621.
49. Spilker, A., and K. Zerbe, Z. angew. Chem. **39,** 1138 **1926.**
50. Sugino, K., and K. Outi, J. Chem. Soc. Japan **62,** 401 **1941;** C.A. **37,** 4726 **1943.**
51. Treibs, W., Ber. **61,** 683 **1928.**
52. van de Kamp, J., A. Burger, and E. Mosettig, J. Am. Chem. Soc. **60,** 1321 **1938.**
53. Virtanen, A. J., Ber. **53,** 1880 **1920.**
54. von Braun, J., and O. Bayer, Ann. **472,** 90 **1929.**
55. von Braun, J., O. Bayer, and L. F. Fieser, Ann. **459,** 287 **1927.**
56. von Braun, J., G. Irmisch, Ber. **65,** 883 **1932.**
57. von Braun, J., and G. Manz, Ber. **63,** 2608 **1930.**
58. von Braun, J., and E. Rath, Ber. **61,** 956 **1928.**
59. Ward, J. J., W. R. Kirner, and H. C. Howard, J. Am. Chem. Soc. **67,** 246 **1945.**
60. Ziegler, K., and F. Ditzel, Ann. **473,** 194 **1929.**

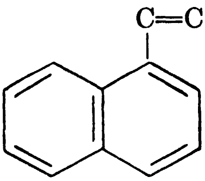
IV. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-14}

1. Naphthalene Derivatives of Empirical Formula C_nH_{2n-14}
2. Cyclanonaphthalenes and Their Alkyl Derivatives
3. Tetrahydroanthracenes, Tetrahydrophenanthrenes, and Their Alkyl Derivatives
4. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-14}

1. NAPHTHALENE DERIVATIVES OF EMPIRICAL FORMULA C_nH_{2n-14}

$C_{12}H_{10}$

1-Ethenylnaphthalene



B. P., °C @ 760mm

126–128	15[16]
124–125	15[32]
116–117	8[29]
105–106	6[34]
103–104	4[34]
115–116	3–4[32]

D_4^{20}

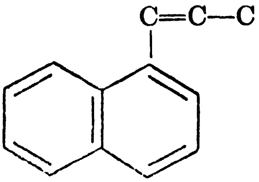
1.034[20]	
1.0656[34]	
1.0439	D_{24}^{24} [29]
1.0361	18° [32]
1.0774	0° [34]

n_D^{20}

1.6388[34]	
1.6436[20, 32]	
1.6425	24° [29]

$C_{13}H_{12}$

1-(Propen-1′-yl)-naphthalene



B. P., °C @ 760mm

275–278[33]	
147–149	15[33]
135–136	12[22]
137–138	10[26]
112–113	6[34]

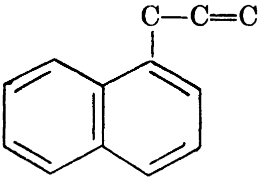
D_4^{20}

1.0282[34]	
1.0429	0° [34]

n_D^{20}

1.6335[34]

1-(Propen-2′-yl)-naphthalene



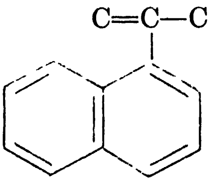
B. P., °C @ 760mm

265–267[33]	
130–131	12[22]
127.5–128.5	8[9]

n_D^{20}

1.6089	25° [9]

1-Isopropenylnaphthalene



B. P., °C @ 760mm

256–257[14]	
251–251.5	744[30]
130–132	15[13]
123–125	10–11[5]
125	8[3, 10, 11, 12]
112–113	6[34]
107–109	4[34]
97	0.1[28]

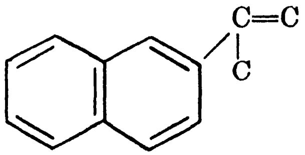
D_4^{20}

1.027^{34}	
1.0078	25°^{30}
1.0143	9°$^{10,\,11}$
1.0208	0°$^{10,\,11}$

n_D^{20}

1.6142^{34}	
1.6070	25°^{28}
1.6068	25°^{30}
1.6040	16°^{13}
1.61435	9°$^{10,\,11}$

2-Isopropenylnaphthalene



M. P., °C

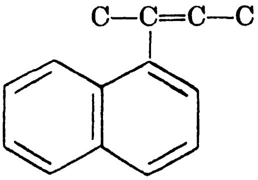
56^2
$46\text{–}47^{10,\,11}$
$45\text{–}47^{12}$

B. P., °C @ 760mm

126–127	12^{27}
155	11^2
138–140	7^{12}

$C_{14}H_{14}$

2-(1′-Naphthyl)-butene-2



B. P., °C @ 760mm

113.5–115	5^{34}

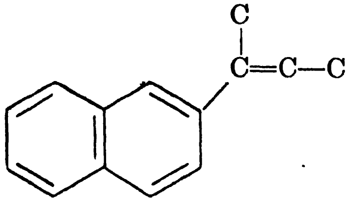
D_4^{20}

1.0533^{34}

n_D^{20}

1.6137^{34}

2-(2′-Naphthyl)-butene-2

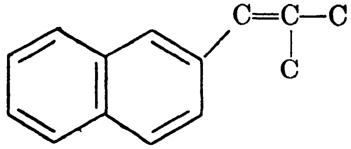


B. P., °C @ 760mm

108–112	0.15^2

n_D^{20} 1.6202^2

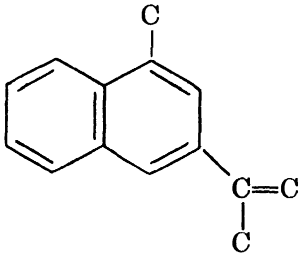
1-(2′-Naphthyl)-2-methylpropene-1



B. P., °C @ 760mm

$287\text{–}288^{15}$

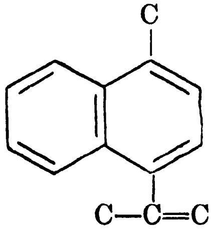
1-Methyl-3-isopropenylnaphthalene



B. P., °C @ 760mm

154	12^7

1-Methyl-4-isopropenylnaphthalene

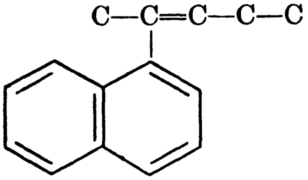


B. P., °C @ 760mm

140	16^8

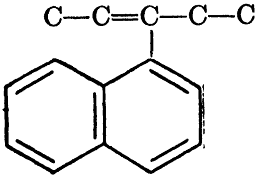
$C_{15}H_{16}$

2-(1′-Naphthyl)-pentene-2



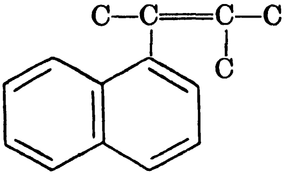
B. P., °C @ 760mm		
	158–160	20[31]
D_4^{20}		
	1.0094	22°[31]
n_D^{20}		
	1.59206	22°[31]

3-(1′-Naphthyl)-pentene-2



B. P., °C @ 760mm		
	119–120	6[34]
D_4^{20}		
	1.034[34]	
n_D^{20}		
	1.597[34]	

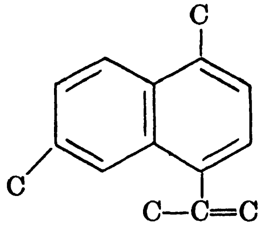
2-Methyl-3-(1′-naphthyl)-butene-2



B. P., °C @ 760mm		
	165–166	23[31]
D_4^{20}		
	1.0039	19°[31]
n_D^{20}		
	1.59343	19°[31]

1,6-Dimethyl-4-isopropenylnaphthalene

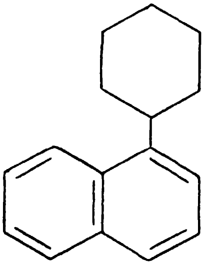
(Dehydrocadalene)



B. P., °C @ 760mm		
	154	14[1]
	155–157	12[21]
D_4^{20}		
	0.9731[21]	
n_D^{20}		
	1.5572[21]	

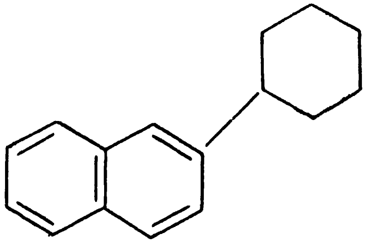
$C_{16}H_{18}$

1-Cyclohexylnaphthalene



B. P., °C @ 760mm		
	118–120	0.3[6]
D_4^{20}		
	1.044	15°[6]
n_D^{20}		
	1.6099	17°[6]
	1.6000	11°[6]

2-Cyclohexylnaphthalene



M. P., °C

$31^{4,\ 6,\ 24}$

B. P., °C @ 760mm

190–195	15^{25}

D_4^{20}

1.0074	$40°\ ^{24}$
1.0049	$D_{15}^{40}\ ^{24}$
1.020	$D_{25}^{25}\ ^{25}$

n_D^{20}

1.5973^{25}	
1.5925	$40°\ ^{24}$

1-Methyl-x-cyclopentylnaphthalene (a)

B. P., °C @ 760mm

156–158	1^{23}

D_4^{20}

1.0353^{23}	
1.0419	$D_{15}^{15}\ ^{23}$

n_D^{20}

1.6088^{23}

(a) The structure of this compound was not clearly defined in the literature.

$C_{17}H_{20}$

2-(2′-Naphthyl)-5-methylhexene-x (a)

B. P., °C @ 760mm

175–178	$10^{10,\ 12}$

D_4^{20}

0.9728	$9°\ ^{10}$
0.9808	$0°\ ^{10,\ 12}$

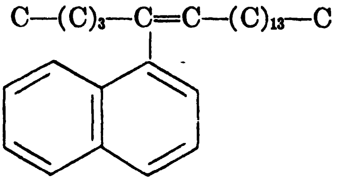
n_D^{20}

1.59124	$9°\ ^{10,\ 12}$

(a) The double bond may be in either the 1- or 2-position.

$C_{30}H_{46}$

5-(1′-Naphthyl)-eicosene-5



D_4^{20}

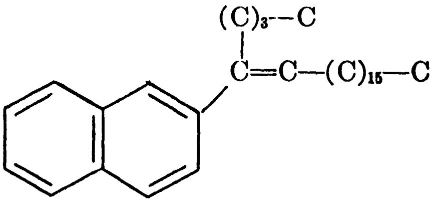
0.9107^{17}

n_D^{20}

1.53019^{17}	
1.52536	$n_{H\alpha}^{20}\ ^{17}$
1.54290	$n_{H\beta}^{20}\ ^{17}$

$C_{32}H_{50}$

5-(2′-Naphthyl)-docosene-5



D_4^{20}

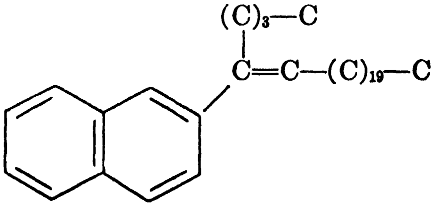
0.9081	$25°\ ^{18}$
0.915	$D_{15.6}^{15.6}\ ^{19}$

n_D^{20}

1.5300	$25°\ ^{18}$

$C_{36}H_{58}$

5-(2′-Naphthyl)-hexacosene-5



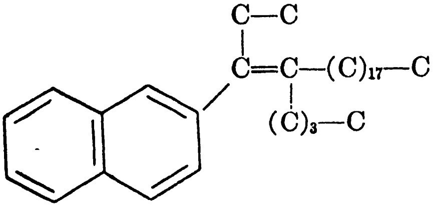
D_4^{20}

0.8830	$25°\ ^{18}$
0.889	$D_{15.6}^{15.6}\ ^{19}$

n_D^{20}

1.5128	$25°\ ^{18}$

3-(2′-Naphthyl)-4-*n*-butyldocosene-3



D_4^{20}

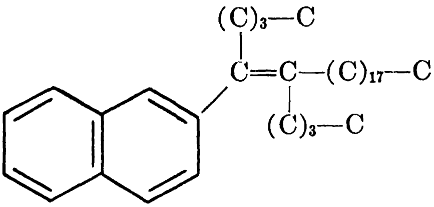
	0.8960	25° [18]
	0.902	$D_{15.6}^{15.6}$ [19]

n_D^{20}

	1.5170	25° [18]

$C_{38}H_{62}$

5-(2′-Naphthyl)-6-*n*-butyltetracosene-5



D_4^{20}	0.8896	25° [18]
	0.895	$D_{15.6}^{15.6}$ [19]
n_D^{20}	1.5161	25° [18]

References on Naphthalene Derivatives of Empirical Formula C_nH_{2n-11}

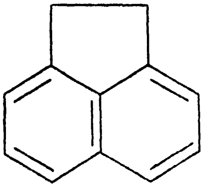
1. Barnett, E. de B., and J. W. Cook, J. Chem. Soc. **1933,** 22.
2. Bergmann, F., and A. Weizmann, J. Org Chem. **9,** 352 **1944.**
3. Bergmann, E., and A. Weizmann, Trans. Faraday Soc. **32,** 1327 **1936.**
4. Bodroux, D., Ann. chim. [10] **11,** 511 **1929.**
5. Cook, J. W., J. Chem. Soc. **1932,** 456.
6. Cook, J. W., and C. A. Lawrence, J. Chem. Soc. **1936,** 1431.
7. Darzens, G., and A. Levy, Compt. rend. **201,** 152 **1935.**
8. Dziewoński, K., and M. Marusińka, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1938A,** 316.
9. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **60,** 1658 **1938.**
10. Grignard, V., Ann. chim. phys. [7] **24,** 433 **1901.**
11. Grignard, V., Ann. Univ. Lyon **1901, 1.**
12. Grignard, Bull. soc. chim. [3] **25,** 497 **1901.**
13. Herzenberg, J., and E. von Winterfeld, Ber. **64,** 1036 **1931.**
14. Kay, F. W., and A. Morton, J. Chem. Soc. **105,** 1565 **1914.**
15. Klinckhard, T., Ann. **379,** 362 **1911.**
16. Koton, M. M., J. Gen. Chem. (U.S.S.R.) **9,** 1626 **1939.**
17. Larsen, R. G., R. E. Thorpe, and F. A. Armfield, Ind. Eng. Chem. **34,** 183 **1942.**
18. Mikeska, L A., Ind. Eng. Chem. **28,** 970 **1936.**
19. Nelson, W. L., Oil Gas J. **35,** No. 44, 46 **1937.**
20. Palfray, L., S. Sabetay, and D. Sontag, Compt. rend. **194,** 2065 **1932.**
21. Perrottet, E., W. Taub, and E. Briner, Helv Chim. Acta **23,** 1260 **1940.**
22. Pestemer, M., and F. Manchen, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **145,** Abt. IIb, 312 **1936.**
23. Pokrovskaya, E. S, J. Gen. Chem. (U S.S.R) **13,** 579 **1943;** Survey For. Petrol Liter. T172B, Oct. 20, **1944.**
24. Pokrovskaya, E. S., and T. G. Stepanseva, J. Gen. Chem. (U.S.S.R.) **9,** 1953 **1939;** C.A. **34,** 4731 **1940.**
25. Price, C. C., and J. M. Ciskowski, J. Am. Chem. Soc **60,** 2499 **1938.**
26. Rousset, L., Bull. soc. chim. [3] **17,** 812 **1897.**
27. Ruzicka, L., and E. Capato, Ann. **453,** 62 **1927.**
28. Sapiro, R. H., R. P. Linstead, and D. M. Newitt, J. Chem. Soc. **1937,** 1784.
29. Shorygin, P. P., and N. V. Shorygina, J. Gen. Chem. (U.S.S.R.) **5,** 555 **1935;** C.A. **29,** 6885 **1935.**
30. Shurakovskiĭ, E., J. Russ. Phys. Chem. Soc. **41,** 1687 **1909;** C.A. **5,** 1097 **1911;** Chem. Zentr. **1910,** I, 1144.
31. Soniss, S. A., J. Gen. Chem. (U.S.S.R.) **9,** 119 **1939;** Chem. Zentr. **1939, II,** 3276.

32. Sontag, D., Ann. chim. [11] **1**, 359 **1934**.
33. Tiffeneau and Daudel, Compt. rend. **147**, 678 **1908**.
34. Zalkind, Y. S., and S. A. Zoniş, J. Gen. Chem. (U.S.S.R.) **6**, 988 **1936**; C.A. **31**, 676 **1937**; Chem. Zentr. **1937**, I, 1934.

2. CYCLANONAPHTHALENES AND THEIR ALKYL DERIVATIVES, C_nH_{2n-14}

$C_{12}H_{10}$

Acenaphthene



M. P., °C

95 .4
100[30, 80]
99–100[29]
99[37, 72]
96.5[46]
96.2[19, 20, 21]
94–96[2, 31]
95.5[18]
95.0[39, 65]
95(a)
94.1[55]
94.0[38]
94[28]
93–94[34]
93.5[51, 61, 78]
93.3[54, 77]
93[4, 5, 6]
92–93[58, 59]
92.5[27]
92.1[16]

B. P., °C @ 760mm

277 .3
279[30, 62, 83]
278[84]
277.9[44]
277.5[1, 3, 41, 68]
277.3[55]

287.8	943.0[55]
287.0	932.3[55]
286.8	930.3[55]
275.4	733.4[55]
275.3	733.4[55]
264.4	573.5[55]
264.4	573.1[55]
252.5	434.7[55]
252.4	434.5[55]
247.0	382.9[55]
246.6	377.9[55]
246.2	374.6[55]
233.2	272.0[55]
229.5	250[64]
227.2	234.6[55]
210.4	149.0[55]
210.2	148.0[55]
182.4	63.6[55]
147	20[48]
147.2	19.2[55]
144	12[62]
20.0	<.02[45]

D_4^{20}

1.220 (solid) (b)[56]

0.962	178.7° [18]
1.003	128.6° [18]
1.0300	103° [73]
1.0685	D_{100}^{100} [64]
1.0242	99.2° [81]
1.0331	98.8° [15]
1.0687	D_{95}^{95} [64]
1.2195	24.8° [32]

n_D^{20}

1.60658	99.2° [81]
1.60482	98.8° [15]
1.59877	$n_{H\alpha}^{99.2}$ [81]
1.59772	$n_{H\alpha}^{98.8}$ [15]

1.62838	$n_{H\beta}^{99.2\ 81}$
1.62705	$n_{H\beta}^{98\ 8\ 15}$

Additional Data

Crit. Temp. (°C)

530.0^{82}

$$\frac{1}{T_b} = 0.0028359-0.0003538 \log_{10} p_{mm}$$

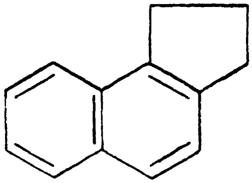
(60 to 945mm)

(a) The melting point 95 is found in references 1, 3, 7, 15, 24, 33, 35, 47, 52, 53, 57, 60, 62, 63, 67, 68, 69, 74, 79, 81, 83, 84.

(b) The temperature of this determination was not given.

$C_{13}H_{12}$

1,2-Cyclopentanonaphthalene



B. P., °C @ 760mm

296–296.6	757.5^{17}
294–295	757^{40}
170	15^{14}
118	0.5^{36}

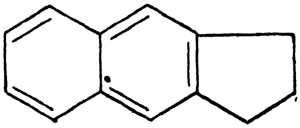
D_4^{20}

1.066^{40}	
1.0569	$19.6°\ ^{36}$
1.0671	$17.5°\ ^{17}$

n_D^{20}

1.6290^{40}	
1.6323	$19.7°\ ^{14}$
1.62649	$19.6°\ ^{36}$
1.6325	$17.5°\ ^{17}$

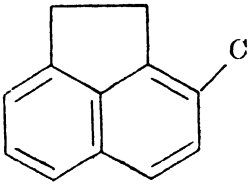
2,3-Cyclopentanonaphthalene



M. P., °C

$94^{75,\ 76}$

3-Methylacenaphthene



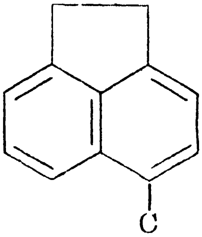
M. P., °C

57^{11}

B. P., °C @ 760mm

130–135	3^{11}

5-Methylacenaphthene



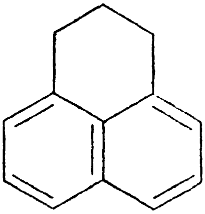
M. P., °C

88^{11}

B. P., °C @ 760mm

125	12^{11}

Phenalan



M. P., °C

65.4

$68–69^{42}$

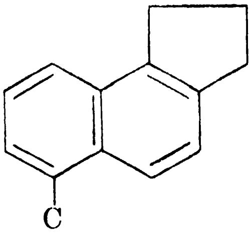
$66–67^{25}$

$65.1–65.4^{22}$

65^{12}

$C_{14}H_{14}$

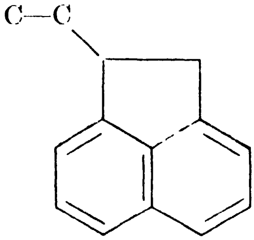
1,2-Cyclopentano-5-methylnaphthalene



M. P., °C

44[50]

1-Ethylacenaphthene

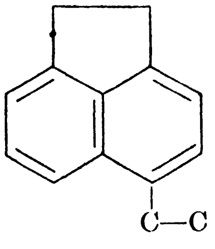


M. P., °C

34.8–35.1[23]

30[13]

5-Ethylacenaphthene



M. P., °C

42.5–43.0[70]

42.5–43[26]

B. P., °C @ 760mm

310[18]	
166	20[48]
160	20[70]
158	13[26]

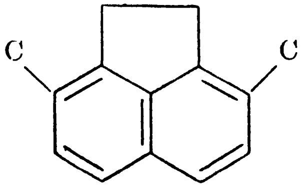
D_4^{20}

1.0407[26]

n_D^{20}

1.6117[26]

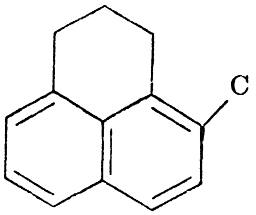
3,8-Dimethylacenaphthene



M. P., °C

68[11]

4-Methylphenalan

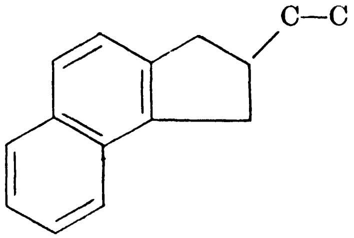


B. P., °C @ 760mm

160–170	7[9]

$C_{15}H_{16}$

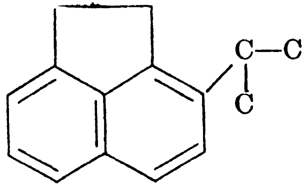
2-Ethyl-4,5-benzoindane



B. P., °C @ 760mm

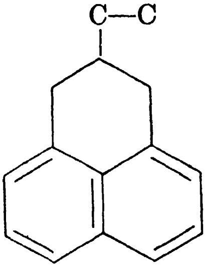
157–160	14[49]

3-Isopropylacenaphthene



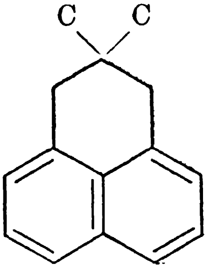
B. P., °C @ 760mm
145–150 0.8[11]

2-Ethylphenalan



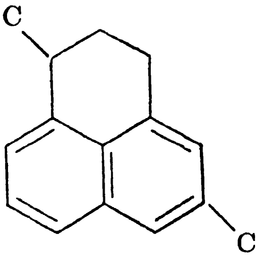
B. P., °C @ 760mm
167–168 16[49]

2,2-Dimethylphenalan



B. P., °C @ 760mm
168–170 17[8]

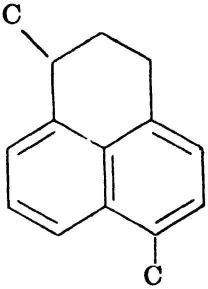
1,5-Dimethylphenalan



M. P., °C
43–44[10]

B. P., °C @ 760mm
150–160 1.2[10]

1,6-Dimethylphenalan

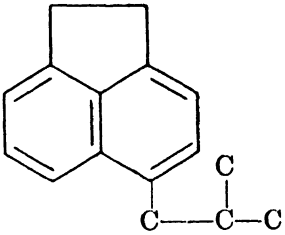


M. P., °C
75[10]

B. P., °C @ 760mm
150 0.8[10]

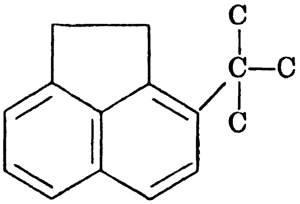
$C_{16}H_{18}$

5-Isobutylacenaphthene



B. P., °C @ 760mm
138–139 0.5[43]

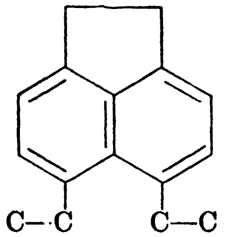
3-*tert*-Butylacenaphthene



M. P., °C
73–74[66]

B. P., °C @ 760mm
170–174 7[66]
155–160 0.8[11]

5,6-Diethylacenaphthene

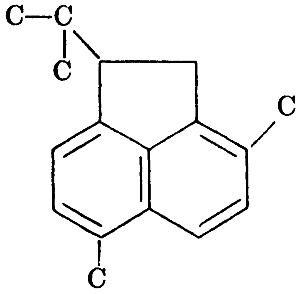


M. P., °C
10–11$^{26, 70}$

B. P., °C @ 760mm
182 14$^{26, 70}$

$C_{17}H_{20}$

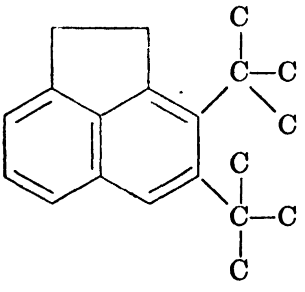
1-Isopropyl-3,6-dimethylacenaphthene



B. P., °C @ 760mm
125 0.05^{71}

$C_{20}H_{26}$

3,4-Di-*tert*-butylacenaphthene



M. P., °C
162–163^{66}

B. P., °C @ 760mm
358–360 758^{66}

References on Cyclanonaphthalenes and Their Alkyl Derivatives

1. Behr, A., and W. A. van Dorp, Ann. **172,** 263 **1874.**
2. Behr, A., and W. A. van Dorp, Ber. **6,** 60 **1873.**
3. Behr and van Dorp through C. Graebe and F. Bossel, Ann. **290,** 207 **1896.**
4. Berthelot, M., Ann. suppl. **5,** 367 **1867.**
5. Berthelot, Bull. soc. chim. [2] **8,** 226 **1867.**
6. Berthelot, Compt. rend. **65,** 507 **1867.**
7. Billows, E., Riv. min. crist. ital. **26,** 5 **1901.**
8. Buu-Hoï and P. Cagniant, Compt. rend. **216,** 346 **1943;** C.A. **38,** 3077 **1944.**
9. Buu-Hoï and P. Cagniant, Rev. sci. **79,** 644 **1941;** C.A. **38,** 3612 **1944.**
10. Buu-Hoï and P. Cagniant, Rev. sci. **80,** 130 **1942;** C.A. **38,** 3612 **1944.**
11. Buu-Hoï and P. Cagniant, Rev. sci. **80,** 176 **1942;** C.A. **38,** 4933 **1944;** Chem. Zentr. **1943,** I, 2680.
12. Clar, E., Ber. **76,** 458 **1943.**
13. Cook, J. W., G. A. D. Haslewood, and A. M. Robinson, J. Chem. Soc. **1935,** 667.
14. Cook, J. W., and C. L. Hewett, J. Chem. Soc. **1933,** 1098.
15. Crompton, H , and W. R. Smyth, J. Chem. Soc. **103,** 1302 **1913.**
16. Crompton, H., and M. Walker, J. Chem. Soc. **101,** 958 **1912.**
17. Denisenko, Y. I., J. Gen. Chem. (U.S.-S.R.) **8,** 410 **1938;** C.A. **32,** 7899 **1938;** Chem. Zentr. **1939,** II, 630.
18. Dutoit, P., and L. Friederich, Arch. sci. phys. nat. [4] **9,** 105 **1900.**
19. Efremov, N. N., J. Russ. Phys. Chem. Soc. **50,** 429 **1920;** Beil. **5,** 275 **1930.**
20. Efremov, N. N., and A. M. Tikhomirova, Ann. inst. anal. phys. chim. (U.S.S.R.) **4,** 92 **1928;** C.A. **23,** 3214 **1929;** Chem. Zentr. **1929,** I, 745.
21. Efremov, N. N., and A. N. Tikhomirova, J. Russ. Phys. Chem. Soc. **59,** 373 **1927;** C.A. **22,** 2508 **1928;** Chem. Zentr. **1928,** I, 188.
22. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **60,** 1658 **1938.**
23. Fieser, L. F., and G. W. Kilmer, J. Am. Chem. Soc. **62,** 1354 **1940.**

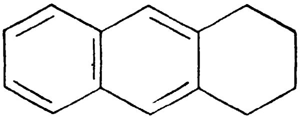
24. Fieser, L. F., and M. A. Peters, J. Am. Chem. Soc. **54,** 4373 **1932.**
25. Fleischer, K., and E. Retze, Ber. **55,** 3280 **1922.**
26. Fleischer, K., and P. Wolff, Ber. **53,** 925 **1920.**
27. Gina, M., Gazz. chim. ital. **46,** I, 289 **1916.**
28. Goldschmiedt, G., and M. von Schmidt, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **83,** Abt. IIb, 7 **1881.**
29. Graebe, C., Ann. **163,** 361 **1872.**
30. Graebe, C., and F. Bossel, Ann. **290,** 206 **1896.**
31. Hahn, D. A., and H. E. Holmes, Ind. Eng. Chem. **13,** 822 **1921.**
32. Hendricks, S. B., and M. E. Jefferson, J. Optical Soc. Am. **23,** 299 **1933.**
33. Hertel, E., and H. Kleu, Z. physik. Chem. **11B,** 59 **1930.**
34. Kagehira, I., Bull. Chem. Soc. Japan **6,** 241 **1931.**
35. Kebler, J. T., and T. H. Norton, Am. Chem. J. **10,** 217 **1888.**
36. Kon, G. A. R , J. Chem. Soc. **1933,** 1081.
37. Kopp, A., Mon. sci. [3] **8,** 1147 **1878.**
38. Kremann, R., E. Honigsberg, and O. Mauermann, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **132,** Abt. IIb, 51 **1923.**
39. Kremann, R., and H. Strzelba, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **130,** Abt. IIb, 173 **1921.**
40. Kruber, O., Ber. **65,** 1382 **1932.**
41. Lagerlöf, D., J. prakt. Chem. [2] **98,** 136 **1918.**
42. Langstein, E., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **119,** Abt. IIb, 675 **1910.**
43. Larsen, R. G., R. E. Thorpe, and F. A. Armfield, Ind. Eng. Chem. **34,** 183 **1942.**
44. Lecat, M., Ann. soc. sci. Bruxelles **49B,** 109 **1929.**
45. Linder, E. G., J. Phys. Chem. **35,** 531 **1931.**
46. Mameli, E., and A. Mossini, Giorn. chim. ind. applicata **15,** 161 **1933.**
47. Manzoni-Ansidei, R., Gazz. chim. ital. **67,** 790 **1937.**
48. Mayer, F., and W. Kaufmann, Ber. **53,** 289 **1920.**
49. Mayer, F., and A. Sieglitz, Ber. **55,** 1835 **1922.**
50. McQuillin, F. J., and R. Robinson, J. Chem. Soc. **1938,** 1097.
51. McVicker, W. H., J. K. Marsh, and A. W. Stewart, J. Chem. Soc. **127,** 999 **1925.**
52. Meyer, R., and K. Taeger, Ber. **53,** 1261 **1920.**
53. Meyer, R., and A. Tanzen, Ber. **46,** 3183 **1913.**
54. Mortimer, F. S., J. Am. Chem. Soc. **44,** 1416 **1922.**
55. Mortimer, F. S., and R. V. Murphy, Ind. Eng. Chem. **15,** 1140 **1923.**
56. Mukherjee, A., Indian J. Phys. **8,** 147 **1933.**
57. Nenhaus, A., Ber. **67,** 1627 **1934.**
58. Oliveri-Mandalà, E., Atti accad. Lincei [5] **21,** I, 779 **1912.**
59. Oliveri-Mandalà, E., Gazz. chim. ital. **68,** 324 **1938.**
60. Orlov, N. A., K. F. Protyanova, and V. P. Flegontov, Refiner and Natural Gasoline Mfr. **17,** 399 **1938,** translated from Khim. Tverdogo Topliva **7,** 748 **1936.**
61. Paillard, H., and R. Duckert, Helv. Chim. Acta **16,** 773 **1933.**
62. Paillard, H., and P. Favarger, Helv. Chim. Acta **16,** 614 **1933.**
63. Pellini, G., Gazz. chim. ital. **31,** I, 1 **1901.**
64. Perkin, W. H., J. Chem. Soc. **69,** 1025 **1896.**
65. Pestemer, M., and F. Manchen, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **145,** Abt. IIb, 312 **1936.**
66. Peters, A. T., J. Chem. Soc. **1942,** 562.
67. Pfeiffer, P., Ann. **440,** 241 **1924.**
68. Quincke, F., Ber. **20,** 609 **1887.**
69. Reingruber, F., Ann. **206,** 367 **1880.**
70. Rowe, F. M., J. Ind. Eng. Chem. **14,** 80 **1922.**
71. Ruzicka, L., and E. Rey, Helv. Chim. Acta **26,** 2136 **1943.**
72. Sabatier, P., and J. B. Senderens, Ann. chim. phys. [8] **4,** 319 **1905.**
73. Schiff, R., Ann. **223,** 247 **1884.**
74. Schönberg, A., Ber. **54,** 2838 **1921.**
75. Sen-Gupta, S. C., Current Sci. **5,** 133 **1936;** C. A. **31,** 5789 **1937.**

76. Sen-Gupta, S. C., J. Indian Chem. Soc. **16,** 89 **1939.**
77. Skau, E. L., J. Phys. Chem. **39,** 761 **1935.**
78. Speyers, C. L., J. Am. Chem. Soc. **18,** 146 **1896.**
79. Terísse, A., Ann. **227,** 133 **1885.**
80. Versmann, F., Chem. News **30,** 203 **1874.**
81. von Auwers, K., and A. Fruhling, Ann. **422,** 196 **1921.**
82. Walden, P., Z. physik. Chem. **65,** 129 **1909.**
83. Waser, E., Helv. Chim. Acta **8,** 758 **1925.**
84. Weger, M., Z. angew. Chem. **22,** 338 **1909.**

3. TETRAHYDROANTHRACENES, TETRAHYDROPHENANTHRENES, AND THEIR ALKYL DERIVATIVES, C_nH_{2n-14}

$C_{14}H_{14}$

1,2,3,4-Tetrahydroanthracene
(Tethracene)



M. P., °C

103 .5
106–107[30]
104–105[21]
103–105[17, 28]
104[33]
103–104[18]
103[7, 16]
100.5–101.5[23]
101[10, 12]

B. P., °C @ 760mm

170–173	14[18]

---

x,x,9,10-Tetrahydroanthracene (a)

M. P., °C

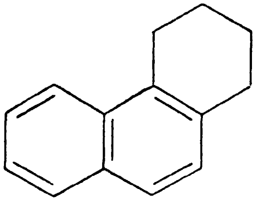
89[8, 9, 11, 28]
74[33]

B. P., °C @ 760mm

309–313[8, 9, 11]

(a) The structure of this compound was not clearly defined in the literature.

1,2,3,4-Tetrahydrophenanthrene
(Tetanthrene)



M. P., °C

33 .5
34–35[6]
33–34[20, 29, 31]
32.5–33.5[1]
33[24]

B. P., °C @ 760mm

173	11[31]
170–171	10[6]

D_4^{20}

1.0601	40° [31]

---

x_4-Tetrahydrophenanthrene (a)

M. P., °C

70[3]
14[35]
−4—−3[27]
−5—−4[27]

B. P., °C @ 760mm

310[4, 13, 14, 19]	
302–302.5[25]	
302[14]	
306–308	737[27]
307	737[27]
302–303	737[27]
300–304	723[2]
147	18[25]
145–149	9[26]

D_4^{20}

1.080[27]	
1.085[27]	
1.0707	24.0° [35]
1.02887	16.8° [25]
1.02934	12.3° [25]
1.067	10.2° [13]

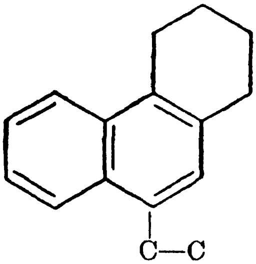
n_D^{20}

1.5820[27]	
1.57909	16.8° [25]
1.58112	12.3° [25]
1.61880	$n_{H\alpha}^{24.0}$ [35]
1.57373	$n_{H\alpha}^{16.8}$ [25]
1.57560	$n_{H\alpha}^{12.3}$ [25]
1.64684	$n_{H\beta}^{24.0}$ [35]
1.59369	$n_{H\beta}^{16.8}$ [25]
1.59550	$n_{H\beta}^{12.3}$ [25]
1.62660	$n_{He}^{24.0}$ [35]

(a) The structure of this compound was not clearly defined in the literature. The data probably represent more than one compound.

$C_{16}H_{18}$

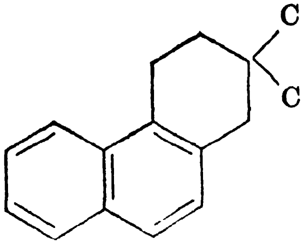
9-Ethyl-1,2,3,4-tetrahydrophenanthrene



M. P., °C

23–25[1]

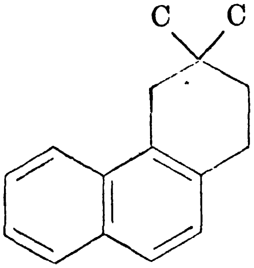
2,2-Dimethyl-1,2,3,4-tetrahydrophenanthrene



B. P., °C @ 760mm

161–163 6[32]

3,3-Dimethyl-1,2,3,4-tetrahydrophenanthrene

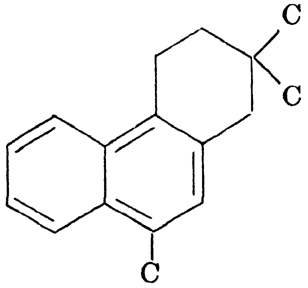


B. P., °C @ 760mm

155–157 7[32]

$C_{17}H_{20}$

2,2,9-Trimethyl-1,2,3,4-tetrahydrophenanthrene

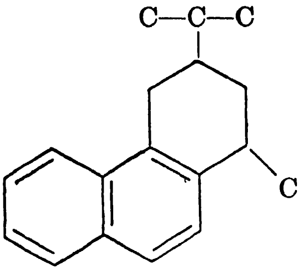


M. P., °C

90–91[32]

$C_{18}H_{22}$

1-Methyl-3-isopropyl-1,2,3,4-tetrahydrophenanthrene



B. P., °C @ 760mm

208	23[5]

1-Methyl-7-isopropyl-x_4-tetrahydrophenanthrene (a)

B. P., °C @ 760mm

360–366[22]	
280	50[2]
180–183	10[34]

D_4^{20}

1.0057[34]

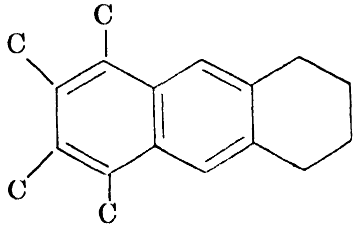
1.011[22]

n_D^{20}

1.56061[34]

(a) The structure of this compound was not clearly defined in the literature.

5,6,7,8-Tetramethyl-1,2,3,4-tetrahydroanthracene



M. P., °C

127.5–128[15]

References on Tetrahydroanthracenes, Tetrahydrophenanthrenes, and Their Alkyl Derivatives

1. Bachmann, W. E., and W. S. Struve, J. Org. Chem. **4, 472 1939.**
2. Bamberger, E., and W. Lodter, Ber. **20,** 3073 **1887.**
3. Breteau, P., Bull. soc. chim. [4] **9,** 515 **1911.**
4. Breteau, P., Bull. soc. chim. [4] **9, 764 1911.**
5. Darzens, G., and A. Levy, Compt. rend. **201,** 152 **1935.**
6. Durland, J. R., and H. Adkins, J. Am. Chem. Soc. **60,** 1501 **1938.**
7. Fries, K., and K. Schilling, Ber. **65,** 1494 **1932.**
8. Godchot, M., Ann. chim. phys. [8] **12,** 468 **1907.**
9. Godchot, M , Bull. soc. chim. [3] **31,** 1339 **1904.**
10. Godchot, M., Bull. soc. chim. [4] **1,** 719 **1907.**
11. Godchot, M., Compt. rend. **139,** 604 **1904.**
12. Godchot, M., Compt. rend. **142,** 1202 **1906.**
13. Graebe, C., Ber. **8,** 1054 **1875.**
14. Grinbaum, R., and L. Marchlewski, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1937A,** 171.
15. Hewett, C. L., J. Chem. Soc. **1940,** 293.
16. Hugel, G., and J. Friess, Ann. combustibles liquides **6,** 1109 **1931.**
17. Ipatieff, V., V. Yakovlev, and L. Rakitin, Ber. **41,** 996 **1908.**
18. Klepper, J., Compt. rend. Congr. chim. ind. **8,** 261 **1929.**
19. Lebeau, P., and M. Picon, Compt. rend. **159,** 70 **1914.**
20. Mameli, E., and A. Mossini, Giorn. chim. ind. applicata **15,** 161 **1933.**
21. Meerwein, H., and A. Migge, Ber. **62,** 1046 **1929.**
22. Olsson, J., Ing. Vetenskaps Akad., Handl. **1931,** No. 111, 27 pp.; Chem. Zentr. **1931,** II, 3420.
23. Orchin, M., J. Am. Chem. Soc. **66, 535 1944.**
24. Orlov, N. A., Ber. **62,** 710 **1929.**
25. Pellini, G., Gazz. chim. ital. **31, I, 1 1901.**
26. Schlenk, W., and E. Bergmann, Ann. **463,** 1 **1928.**
27. Schmidt, J., and R. Mezger, Ber. **40,** 4240 **1907.**

28. Schroeter, G., Ber. **57,** 2003 **1924.**
29. Schroeter, G., Ber. **57,** 2025 **1924.**
30. Schroeter, G., Ber. **60,** 2035 **1927.**
31. Schroeter, G., H. Müller, and J. Y. S. Huang, Ber. **62,** 645 **1929.**
32. Sengupta, S. C., J. prakt. Chem. [2] **152,** 9 **1939.**
33. Sugino, K., and K. Outi, J. Chem. Soc. Japan **62,** 401 **1941;** C. A. **37,** 4726 **1943.**
34. Virtanen, A. J., Ber. **53,** 1880 **1920.**
35. von Auwers, K., and R. Kraul, Ann. **443,** 181 **1925.**

4. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-14}

$C_{13}H_{12}$

x,x-Dihydrofluorene (a)

M. P., °C
109[5, 7, 8]

B. P., °C @ 760mm
251–254[5, 7, 8]

(a) The structure of this compound was not clearly defined in the literature.

$C_{16}H_{18}$

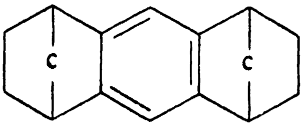
x_8-Octahydrofluoranthene (a)

(Octahydroidryl)

B. P., °C @ 760mm
309–311[3]

(a) The structure of this compound was not clearly defined in the literature.

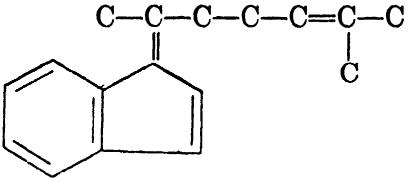
1,4,5,8-Diendomethylene-1,2,3,4,5,6,7,8-octahydroanthracene



M. P., °C
157[2]

$C_{17}H_{20}$

2-(1′-Indenylidene)-6-methylheptene-5

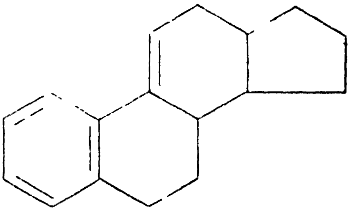


B. P., °C @ 760mm
130 0.2[9]

D_4^{20}
0.9680 24°[9]

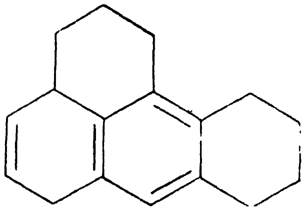
n_D^{20}
1.5942 24°[9]

1,2-Cyclopentano-1,2,3,9,10,10a-hexahydrophenanthrene



B. P., °C @ 760mm
164–165 3[4]

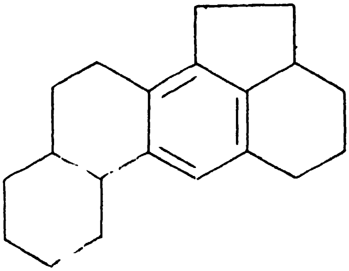
4,5-Cyclohexano-7,9a-dihydrophenalan



B. P., °C @ 760mm
213–214 13[10]

$C_{20}H_{26}$

2a,3,4,5,6b,7,8,9,10,10a,11,12-Dodecahydrocholanthrene



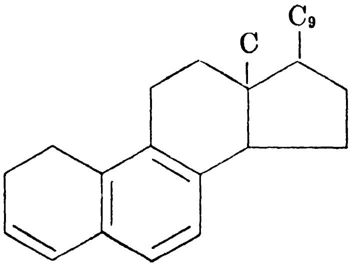
M. P., °C

62–63[1]

$C_{27}H_{40}$

1,2-(3′-Nonylcyclopentano)-2-methyl-1,2,3,4,5,6-hexahydrophenanthrene

(Ergopentaene)



M. P., °C

89–90[11]

Additional Data

$[\alpha]_D^{19} = +69.5°$ [11]

$[\alpha]_D^{19} = +66.7°$ [11]

$C_{34}H_{54}$

Tolylcholestane (a)

M. P., °C

202 (b)[6]

120 (b)[6]

(a) The structure of this compound was not clearly defined in the literature.

(b) These constants were determined on isomeric forms.

References on Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-14}

1. Cook, J. W., and G. A. D. Haslewood, J. Chem. Soc. **1935**, 767.
2. Diels, O., and K. Alder, Ann. **460**, 98 **1928**.
3. Goldschmidt, G., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **81**, Abt. I, 415 **1880**.
4. Hawthorne, J. R., and R. Robinson, J. Chem. Soc. **1936**, 763.
5. Hofmann, F., and P. Damm, Brennstoff-Chem. **3**, 73, 81 **1922**.
6. Kawasaki, C., J. Pharm. Soc. Japan **57**, 713 **1937**; C. A. **32**, 187 **1938**; Chem. Zentr. **1938**, II, 81.
7. Pictet, A., Ann. chim. [9] **10**, 249 **1918**.
8. Pictet, A., L. Ramseyer, and O. Kaiser, Compt. rend. **163**, 358 **1916**.
9. Ruzicka, L., and E. Peyer, Helv. Chim. Acta **18**, 676 **1935**.
10. von Braun, J., and O. Bayer, Ber. **58**, 2667 **1925**.
11. Windaus, A., and M. Deppe, Ber. **70**, 76 **1937**.

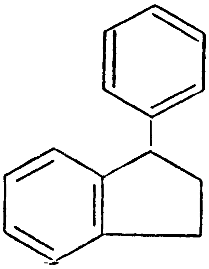
V. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-16}

1. Indane with One Phenyl Substitution
2. Naphthalene Derivatives of Empirical Formula C_nH_{2n-16}
3. Tetrahydronaphthalene with One Phenyl Substitution
4. Biphenylene, Fluorene, and Their Alkyl Derivatives
5. Dihydroanthracenes, Dihydrophenanthrenes, and Their Alkyl Derivatives
6. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-16}

1. INDANE WITH ONE PHENYL SUBSTITUTION, C_nH_{2n-16}

$C_{15}H_{14}$

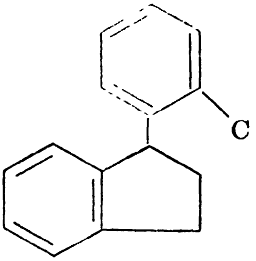
1-Phenylindane



B. P., °C @ 760mm
148–150 13[4]

$C_{16}H_{16}$

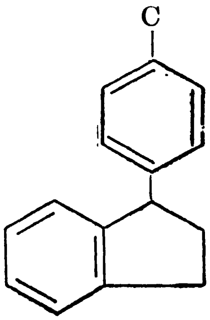
1-*o*-Tolylindane



M. P., °C
57[9]

B. P., °C @ 760mm
160–162 14[9]

1-*p*-Tolylindane

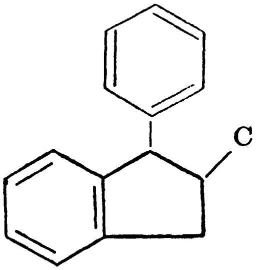


B. P., °C @ 760mm
168–170 14[9]

D_4^{20}
1.0455[9]

n_D^{20}
1.5878[9]

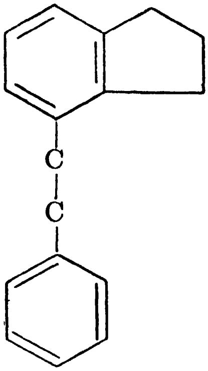
1-Phenyl-2-methylindane



B. P., °C @ 760mm
181 10[3]

$C_{17}H_{18}$

4-Phenethylindane



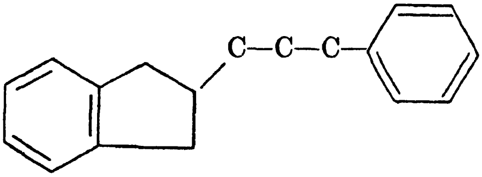
B. P., °C @ 760mm
115–120 0.0001[5]

D_4^{20}
1.020 25° [5]

n_D^{20}
1.5640 29° [5]

$C_{18}H_{20}$

1-Phenyl-3-(2′-indanyl)-propane (a)



B. P., °C @ 760mm

197	13[8]

D_4^{20}

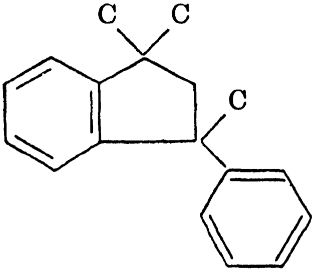
1.0128	18°[8]

n_D^{20}

1.5667	18°[8]

(a) This compound was given as 2γ-phenylpropylhydrindene in the literature, but no structural formula was given.

1,1,3-Trimethyl-3-phenylindane



M. P., °C

53[2]

52[10]

B. P., °C @ 760mm

307–310[6]	
166–167	25[2]
165–166	24[2]
155	12[2]

D_4^{20}

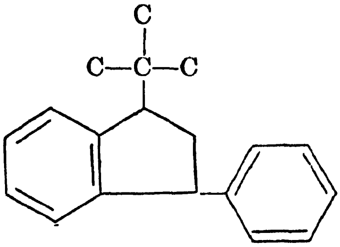
1.0009[6]

n_D^{20}

1.56809[6]

$C_{19}H_{22}$

1-*tert*-Butyl-3-phenylindane

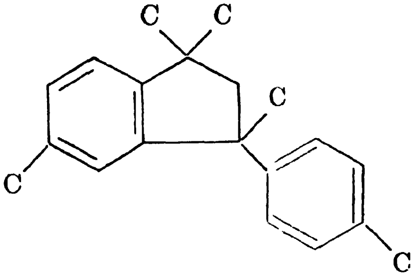


M. P., °C

181–182[1]

$C_{20}H_{24}$

1,1,3,5-Tetramethyl-3-*p*-tolylindane



M. P., °C

37.5–38.5[7]

B. P., °C @ 760mm

328.5–329	759[7]

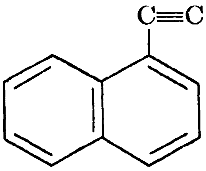
References on Indane with One Phenyl Substitution

1. Althausen, D., and C. S. Marvel, J. Am. Chem. Soc. **54,** 1174 **1932.**
2. Bergmann, E., Ber. **64,** 1493 **1931.**
3. Blum-Bergmann, O., Ber. **65,** 109 **1932.**
4. Mayer, F., A. Sieglitz, and W. Ludwig, Ber. **54,** 1397 **1921.**
5. Natelson, S., and S. P. Gottfried, J. Am. Chem. Soc. **58,** 1432 **1936.**
6. Puranene, N., Ann. Acad. Sci. Fennicae **37A,** No. 10, 1 **1933;** Chem. Zentr. **1933,** II, 856.
7. Puranene, N., Suomen Kemistilehti **5,** 42B **1932;** Chem. Zentr. **1933,** I, 934.
8. von Braun, J., and G. Manz, Ann. **468,** 258 **1929.**
9. von Braun, J., G. Manz, and E. Reinsch, Ann. **468,** 277 **1929.**
10. Welsh, L. H., and N. L. Drake, J. Am. Chem. Soc. **60,** 59 **1938.**

2. NAPHTHALENE DERIVATIVES OF EMPIRICAL FORMULA C_nH_{2n-16}

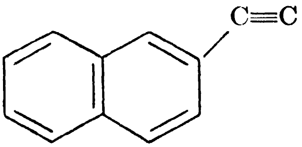
$C_{12}H_8$

1-Ethynylnaphthalene



B. P., °C @ 760mm
143-44 25[15, 17]
D_4^{20}
1.057[17]

2-Ethynylnaphthalene



M. P., °C
36[16, 22]
B. P., °C @ 760mm
104-107 2[22]
104-107 1[22]

$C_{13}H_{10}$

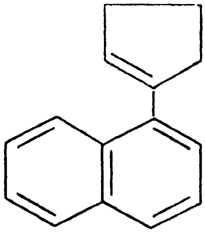
1-(Propyn-x′-yl)-naphthalene (a)

B. P., °C @ 760mm
154 15[4]
D_4^{20}
1.056 13°[4]
1.066 0°[4]
n_D^{20}
1.630 13°[4]

(a) The double bond may be in either the 1- or 2-position.

$C_{15}H_{14}$

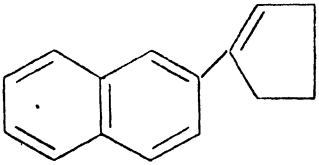
1-(Cyclopenten-1′-yl)-naphthalene



M. P., °C
−2 (a)[1]
B. P., °C @ 760mm
165–168 1[1]
115 0.04[2]
D_4^{20}
1.0611 24°[2]
n_D^{20}
1.6285[2]

(a) This constant was given as a freezing point in the literature.

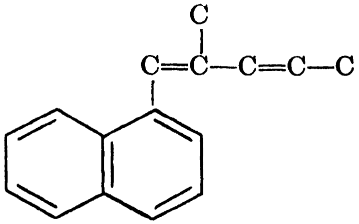
2-(Cyclopenten-1′-yl)-naphthalene



M. P., °C
85–86[1]

$C_{16}H_{16}$

1-(1′-Naphthyl)-2-methylpentadiene-1,3



B. P., °C @ 760mm
178–181 12[5]

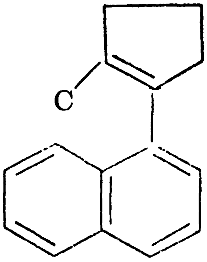
D_4^{20}

0.9801   25° [5]

n_D^{20}

1.56967   25° [5]

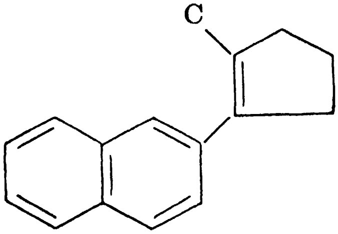
1-(1′-Naphthyl)-2-methylcyclopentene-1



B. P., °C @ 760mm

165–168   1[1]

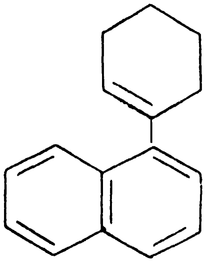
1-(2′-Naphthyl)-2-methylcyclopentene-1



B. P., °C @ 760mm

180–182   1[1]

1-(Cyclohexen-1′-yl)-naphthalene



M. P., °C

46[10]

44[10]

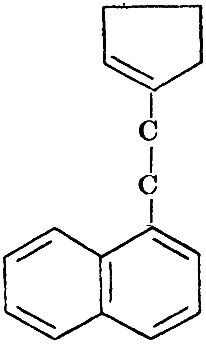
36[23]

B. P., °C @ 760mm

332[23]

$C_{17}H_{18}$

1-(Cyclopenten-1′-yl)-2-(1″-naphthyl)-ethane



B. P., °C @ 760mm

164   4–5[8]

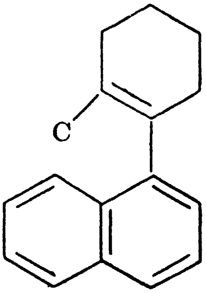
D_4^{20}

1.0298[8]

n_D^{20}

1.6034[8]

1-(1′-Naphthyl)-2-methylcyclohexene-1



M. P., °C

55–56[18]

B. P., °C @ 760mm

125   0.3[11]

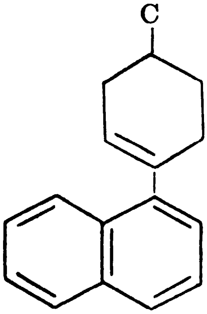
D_4^{20}

1.036   15.5°[11]

n_D^{20}

1.6111   15°[11]

1-(1′-Naphthyl)-4-methylcyclohexene-1



B. P., °C @ 760mm	
142	0.15[3]
n_D^{20}	
1.6040	14° [3]

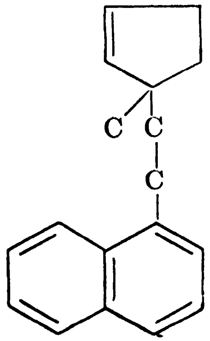
1-(1′-Naphthyl)-x-methylcyclohexene-1 (a)

B. P., °C @ 760mm	
131	0.2[3]
n_D^{20}	
1.6054	14° [3]

(a) The methyl group may be in either the 3- or 5-position.

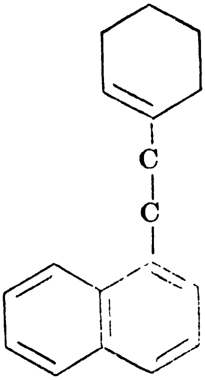
$C_{18}H_{20}$

1-(1′-Methylcyclopentene-2′-yl)-2-(1″-naphthyl)-ethane



B. P., °C @ 760mm	
168–172	0.5[14]

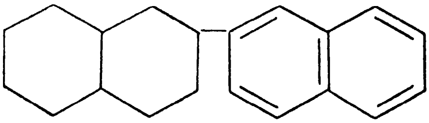
1-(Cyclohexen-1′-yl)-2-(1″-naphthyl)-ethane



B. P., °C @ 760mm	
167–168	3–4[9]
135	0.1[7]
D_4^{20}	
1.0254	23.5° [9]
1.0158	8° [7]
n_D^{20}	
1.5993	23.6° [9]
1.5992	8° [7]

$C_{20}H_{24}$

3-(2′-Naphthyl)-bicyclo-[4,4,0]-decane

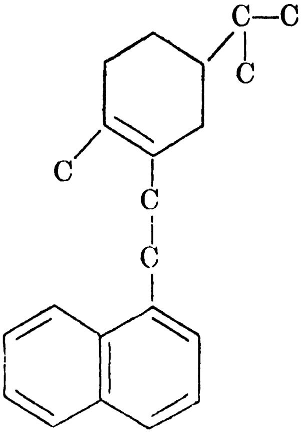


M. P., °C
67 (a)[13]
62 (a)[13]

(a) These constants were determined on isomeric forms.

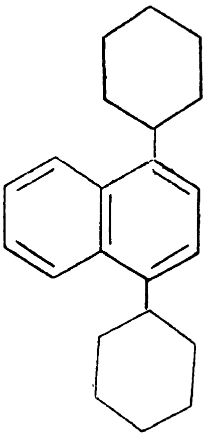
$C_{22}H_{28}$

1-(2′-Methyl-5′-isopropylcyclohexen-1′-yl)-2-(1″-naphthyl)-ethane



B. P., °C @ 760mm
160–165 0.15[12]

1,4-Dicyclohexylnaphthalene



M. P., °C
83–83.5[21]

---

x,x-Dicyclohexylnaphthalene (a)

M. P., °C
151–152[6]
150–151[19]

B. P., °C @ 760mm
215–225 7[20]

(a) The structure of this compound was not clearly defined in the literature.

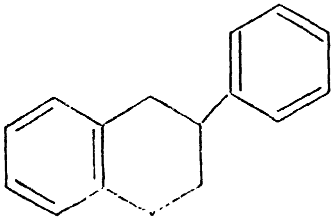
References on Naphthalene Derivatives of Empirical Formula C_nH_{2n-16}

1. Bachmann, W. E., and M. C. Kloetzel, J. Am. Chem. Soc. **60,** 2204 **1938.**
2. Bergmann, E., and F. Bergmann, J. Am. Chem. Soc. **59,** 1443 **1937.**
3. Bergmann, F., and A. Weizmann, J. Org. Chem. **9,** 352 **1944.**
4. Bert, L., and C. Dorier, Bull. soc. chim. [4] **37,** 1600 **1925.**
5. Bjelouss, E., Ber. **45,** 625 **1912.**
6. Bodroux, D., Ann. chim. [10] **11,** 511 **1929.**
7. Cook, J. W., G. A. D. Haslewood, and A. M. Robinson, J. Chem. Soc. **1935,** 667.
8. Cook, J. W., and C. L. Hewett, J. Chem. Soc. **1933,** 1098.
9. Cook, J. W., and C. L. Hewett, J. Chem. Soc. **1934,** 365.
10. Cook, J. W., C. L. Hewett, and C. A. Lawrence, J. Chem. Soc. **1936,** 71.
11. Cook, J. W., and C. A. Lawrence, J. Chem. Soc. **1936,** 1431.
12. Cook, J. W., and A. M. Robinson, J. Chem. Soc. **1938,** 505.
13. Gysin, E., Helv. Chim. Acta **9,** 59 **1926.**
14. Kon, G. A. R., and E. S. Narracott, J. Chem. Soc. **1938,** 672.
15. Leroy, A. J., Bull. soc. chim [3] **6,** 385 **1891.**
16. Leroy, J. A., Bull. soc. chim. [3] **7,** 644 **1892.**
17. Leroy, J. A., Compt. rend. **113,** 1056 **1891.**
18. Mayer, F., and R. Schieffner, Ber. **65,** 1337 **1932.**
19. Pokrovskaya, E. S., and T. G. Stepanseva, J. Gen. Chem. (U.S.S.R.) **9,** 1953 **1939;** C. A. **34,** 4731 **1940.**
20. Price, C. C., and J. M. Ciskowski, J. Am. Chem. Soc. **60,** 2499 **1938.**
21. Price, C. C., H. M. Shafer, M. F. Huber, and C. Bernstein, J. Org. Chem. **7,** 517 **1942.**
22. Robin, J., Ann. chim. [10] **16,** 421 **1931.**
23. Weiss, R., and K. Woidich, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **134,** Abt. IIb, 453 **1925.**

3. TETRAHYDRONAPHTHALENE WITH ONE PHENYL SUBSTITUTION, C_nH_{2n-16}

$C_{16}H_{16}$

2-Phenyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

180–181	13^{10}

D_4^{20}

1.0579	$18^{\circ\,10}$

n_D^{20}

1.5980	$18^{\circ\,10}$

---

x-Phenyl-1,2,3,4-tetrahydronaphthalene (a)

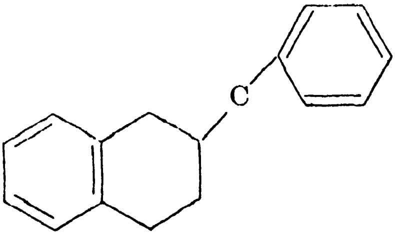
B. P., °C @ 760mm

184–187	14^{7}

(a) The phenyl group may be in either the 2- or 6-position.

$C_{17}H_{18}$

2-Benzyl-1,2,3,4-tetrahydronaphthalene



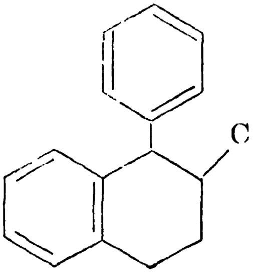
B. P., °C @ 760mm

195	13^{1}
194–195	13^{8}
193	13^{4}

D_4^{20}

1.0428	$22.5^{\circ\,4}$

1-Phenyl-2-methyl-1,2,3,4-tetrahydronaphthalene

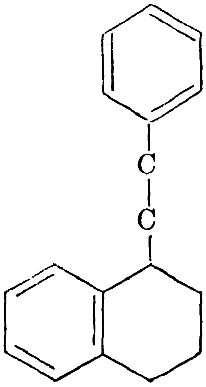


M. P., °C

46–47^{3}

$C_{18}H_{20}$

1-Phenethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

204–208	14^{9}

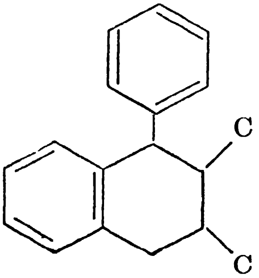
D_4^{20}

1.028	$18^{\circ\,9}$

n_D^{20}

1.5770	$18^{\circ\,9}$

1-Phenyl-2,3-dimethyl-1,2,3,4-tetrahydronaphthalene
(Methronol)

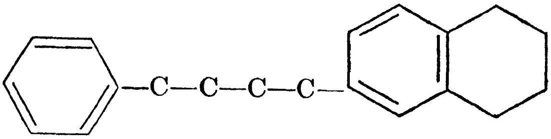


B. P., °C @ 760mm
322–323[2]

This series continued on next page

$C_{20}H_{24}$

1-Phenyl-4-[6′-(1′,2′,3′,4′-tetrahydronaphthyl)]-butane

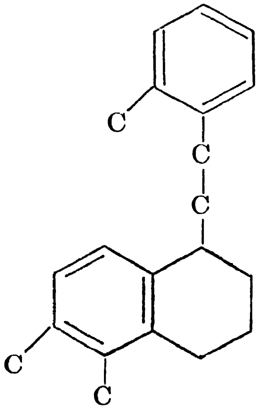


B. P., °C @ 760mm
236–237 13[6]

D_4^{20}
1.0172 22.5° [6]

$C_{21}H_{26}$

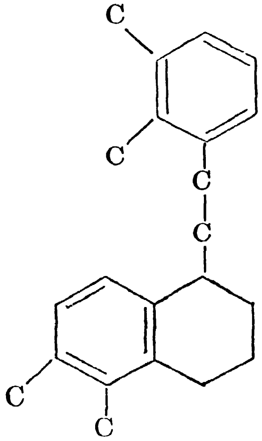
1-(2′-Methylphenethyl)-5,6-dimethyl-1,2,3,4-tetrahydronaphthalene



M. P., °C
53–54[5]

$C_{22}H_{28}$

1-(2′,3′-Dimethylphenethyl)-5,6-dimethyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm
165 1[5]

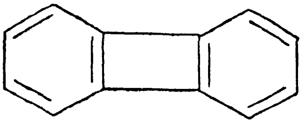
References on Tetrahydronaphthalene with One Phenyl Substitution

1. Borsche, W., P. Hofmann, and H. Kuhn, Ann. **554,** 23 **1943.**
2. Erdmann, H., Ann. **227,** 247 **1885.**
3. Hewett, C. L., J. Chem. Soc. **1936,** 596.
4. Hugel, G., Chimie & industrie **26,** 1282 **1931.**
5. Ruzicka, L., A. Grob, and G. Anner, Helv. Chim. Acta **26,** 254 **1943.**
6. Schroeter, G., Ber. **57,** 1990 **1924.**
7. Spath, E., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **121,** Abt. IIb, 683 **1912.**
8. von Braun, J., Ber. **61,** 441 **1928.**
9. von Braun, J., and G. Kochendorfer, Ber. **56,** 2172 **1923.**
10. von Braun, J., and G. Manz, Ann. **468,** 258 **1929.**

4. BIPHENYLENE, FLUORENE, AND THEIR ALKYL DERIVATIVES, C_nH_{2n-16}

$C_{12}H_8$

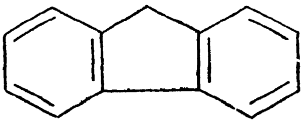
Biphenylene



M. P., °C
111–112[66]
109–110[48]
74.5–75[22]
74–75[59]

$C_{13}H_{10}$

Fluorene



M. P., °C
114
116–117[4, 49]
116[16, 76, 77, 81]
115–116[80]
115.0–115.8[61]
115–115.5[77]
115.4[37]
115[20, 35, 44, 46, 67, 75]
114–115[78]
113–115[33]
114.8[9]
114.5[56]
114–114.5[15]
113.5–114.5[19, 77]
114.2[55]
114[25, 68, 69, 72]
113–114[26, 30, 42, 48]
113–113.5[77]
113.3[54]
113(a)
112–113(b)
112.5[39, 40]
112.3[23, 24]
112.2[40]
112.0[40]
112[47, 51]

B. P., °C @ 760mm

297.2

305[12, 14, 29, 74]

298.0[55]

296[32]

295[52, 76]

294–295[28, 63]

293–295[49, 75]

294[62]

300.4	812.3[55]
299.8	801.3[55]
295.7	738.8[55]
295.6	738.8[55]
277.1	490.7[55]
276.6	487.5[55]
241.4	208.4[55]
240.4	205.5[55]
203.0	70.5[55]
202.5	69.5[55]
170	26[65]
161.0	18.0[55]

D_4^{20}

1.181(c) (solid)[41]

1.200(c) (solid)[57]

1.207(c) (solid)[24]

n_D^{20}

(d)

Additional Data

$$\frac{1}{T_b} = 0.0027238 - 0.0003369 \log_{10} p_{mm}$$

(200 to 813 mm)

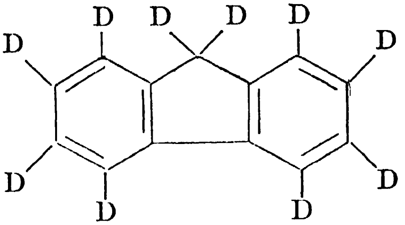
(a) The melting point 113 is found in references 1, 2, 3, 8, 10, 11, 12, 13, 14, 17, 27, 32, 36, 38, 45, 50, 52, 53, 60, 62, 65, 70, 71, 73, 74.

(b) The melting point 112–113 is found in references 5, 6, 7, 21, 28, 31, 63, 64, 79.

(c) The temperature of this determination was not given.

(d) Refractive indices at other lines are found in reference 58.

Decadeuterofluorene



M. P., °C

115–117[18]

References on Biphenylene and Fluorene

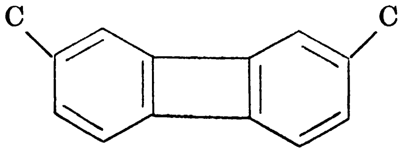
1. Adam, P., Ann. chim. phys. [6] **15, 224 1888.**
2. Adam, P., Bull. soc. chim. [2] **47,** 686 **1887.**
3. Anschutz, R., and G. Schultz, Ann. **196,** 32 **1879.**
4. Askew, F. A., J. Chem. Soc. **1935,** 512.
5. Bamberger, E., and S. C. Hooker, Ann. **229,** 102 **1885.**
6. Bamberger, E., and S. C. Hooker, Ber. **18,** 1030 **1885.**
7. Barbier, P., Ann. chim. phys. [5] **7,** 479 **1876.**
8. Barth, L., and G. Goldschmidt, Ber. **11,** 846 **1878.**
9. Berl, E., and A. Kullman, Ber. **60,** 811 **1927.**
10. Berthelot, Ann. chim. phys. [4] **12,** 173 **1867.**
11. Berthelot, Ann. chim. phys. [4] **12,** 193 **1867.**
12. Berthelot, M., Ann. suppl. **5,** 367 **1867.**
13. Berthelot, Bull. soc. chim.[2] **8,** 226 **1867.**
14. Berthelot, Compt. rend. **65,** 465 **1867.**
15. Capper, N. S., and J. K. Marsh, J. Chem. Soc. **129,** 724 **1926.**
16. Charlampowicz, B., and L. Marchlewski, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1930A,** 376; C. A. **25,** 5096 **1931;** Chem. Zentr. **1931,** I, 425.
17. Charrier, G., and E. Ghigi, Gazz. chim. ital. **63,** 685 **1933.**
18. Clemo, G. R., and A. C. Robson, J. Chem. Soc. **1939,** 429.
19. Cook, J. W., and C. L. Hewett, J. Chem. Soc. **1936, 62.**

20. Delacre, Bull. soc. chim. [3] **27,** 875 **1902.**
21. Dimroth, O., and B. Kerkovius, Ann. **399,** 120 **1913.**
22. Dobbie, J. J., J. J. Fox, and A. J. H. Gauge, J. Chem. Soc. **97.** 683 **1911.**
23. Efremov, N. N., and A. M. Tikhomirova, Ann. inst. anal. phys. chim. (U.S.S.R.) **4,** 92 **1928;** C. A. **23,** 3214 **1929;** Chem. Zentr. **1929,** I, 745.
24. Efremov, N. N., and A. N. Tikhomirova, J. Russ. Phys. Chem. Soc. **59,** 373 **1927;** C. A. **22,** 2508 **1928.**
25. Elagina, N. V., and N. D. Zelinskiĭ, Compt. rend. acad. sci. U.R.S.S. **23,** No. 8, 799 **1939.**
26. Fittig, R., Ber. **6,** 187 **1873.**
27. Fittig, R., and H. Liepmann, Ann. **200,** 1 **1880.**
28. Fittig, R., and A. Schmitz, Ann. **193,** 134 **1878.**
29. Goldschmiedt, G., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **84,** Abt. IIb, 305 **1881.**
30. Graebe, C., Ann. **174,** 177 **1874.**
31. Graebe, C., Ber. **7,** 1623 **1874.**
32. Graebe, C., and C. Aubin, Ann. **247,** 257 **1888.**
33. Graebe, C., and B. von Mantz, Ann. **290,** 238 **1896.**
34. Hengstenberg, J., and H. Mark, Z. Krist. **70,** 283 **1929.**
35. Jeanes, A., and R. Adams, J. Am. Chem. Soc. **59,** 2608 **1937.**
36. Kempf, R., J. prakt. Chem. [2] **78,** 201 **1908.**
37. Kirby, W., J. Soc. Chem. Ind. **59,** 168 **1940.**
38. Kopp, A., Mon. sci. [3] **8,** 1147 **1878.**
39. Kremann, R., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **120,** Abt. IIb, 329 **1911.**
40. Kremann, R., E. Hönigsberg, and O. Mauermann, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **132,** Abt. IIb, 51 **1923.**
41. Krishnan, K. S., and S. Banerjee, Trans. Roy. Soc. (London) **234,** 265 **1935.**
42. Larsen, R. G., R. E. Thorpe, and F. A. Armfield, Ind. Eng. Chem. **34,** 183 **1942.**
43. Lothrop, W. C., J. Am. Chem. Soc. **63,** 1187 **1941.**
44. Mameli, E., Gazz. chim. ital. **67,** 669 **1937.**
45. Manchot, W., and P. Krische, Ann. **337,** 170 **1904.**
46. Manzoni-Ansidei, R., Gazz. chim. ital. **67,** 790 **1937.**
47. McVicker, W. H., J. K. Marsh, and A. W. Stewart, J. Chem. Soc. **127,** 999 **1925.**
48. Menczel, S., Z. physik. Chem. **125,** 161 **1927.**
49. Meyer, H., and A. Hoffmann, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **125/126,** Abt. IIb, 449 **1916-17.**
50. Meyer, R., Ber. **45,** 1609 **1912.**
51. Meyer, R., and K. Taeger, Ber. **53,** 1261 **1920.**
52. Meyer, R., and H. Wesche, Ber. **50,** 422 **1917.**
53. Morgenstern, O., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **120,** Abt. IIb, 523 **1911.**
54. Mortimer, F. S., J. Am. Chem. Soc. **44,** 1416 **1922.**
55. Mortimer, F. S., and R. V. Murphy, Ind. Eng. Chem. **15,** 1140 **1923.**
56. Mortimer, S. P., J. Am. Chem. Soc. **45,** 633 **1923.**
57. Mukherjee, A., Indian J. Phys. **8,** 147 **1933.**
58. Narasimham, K. L., Indian J. Phys. **6,** 233 **1931.**
59. Nierenstein, M., Ann. **386,** 318 **1912.**
60. Nierenstein, M., and C. W. Webster, J. Am. Chem. Soc. **67,** 691 **1945.**
61. Orchin, M., J. Am. Chem. Soc. **67,** 499 **1945.**
62. Pictet, A., Ann. chim. [9] **10,** 249 **1918.**
63. Pictet, A., and L. Ramseyer, Arch. sci. phys. nat. [4] **34,** 234 **1912.**
64. Pictet, A., and L. Ramseyer, Ber. **44,** 2486 **1911.**
65. Ramart-Lucas and J. Hoch, Bull. soc. chim. [5] **2,** 1376 **1935.**
66. Rapson, W. S., R. G. Shuttleworth, and J. N. van Niekerk, J. Chem. Soc. **1943,** 326.
67. Sadikov, W. S., and A. K. Michailov, Ber. **61,** 1792 **1928.**
68. Schlenk, W., Jr., Ber. **64,** 739 **1931.**
69. Schmidt, J., and E. Fischer, Ber. **41,** 4227 **1908.**

70. Schmidt, J., and R. Mezger, Ber. **40,** 4566 **1907.**
71. Schwarz, R., D. Pflugmacher, and M. Ruhnke, J. prakt. Chem. [2] **161,** 137 **1942.**
72. Staudinger, H., and R. Endle, Ber. **46,** 1437 **1913.**
73. Staudinger, H., and A. Gaule, Ber. **49,** 1951 **1916.**
74. Versmann, F., Chem. News **30,** 203 **1874.**
75. Waser, E., Helv. Chim. Acta **8,** 758 **1925.**
76. Weger, M., Z. angew. Chem. **22,** 338 **1909.**
77. Weger, M., and K. Döring, Ber. **36,** 878 **1903.**
78. Wieland, H., C. Schöff, and W. Hermsen, Ann. **444,** 40 **1925.**
79. Zeidler, O., Ann. **191,** 285 **1878.**
80. Zelinskiĭ, N., Ber. **57,** 264 **1924.**
81. Zelinskiĭ, N. D., I. Tits, and M. Gaverdovskaya, Ber. **59,** 2590 **1926.**

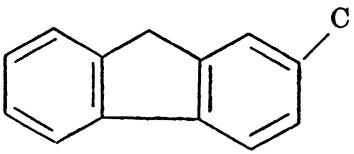
$C_{14}H_{12}$

2,7-Dimethylbiphenylene



M. P., °C
112[17]

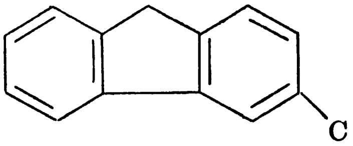
2-Methylfluorene



M. P., °C
104–105[21, 22]
104[14]
102–103[11]

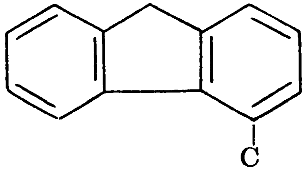
B. P., °C @ 760mm
317–319[14]

3-Methylfluorene



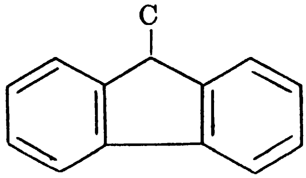
M. P., °C
88–89[20, 23]
88[33]

4-Methylfluorene



M. P., °C
71.5–72.5[29]
63[19]

9-Methylfluorene



M. P., °C
45.5
48[12]
46–47[35]
46[25, 37]
45–46[5, 34]
45[2, 30, 32, 36]
44.5[4]
44[31]

B. P., °C @ 760mm

157	18[27]
141–144	16[32]
154–156	15[36]

D_4^{20}

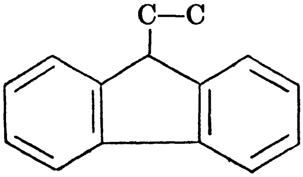
1.070[18]	
1.0263	66.2° [32]

n_D^{20}

1.631^{18}	
1.61009	$66.2°^{32}$
1.60233	$n_{H\alpha}^{66.2}$ ^{32}
1.63189	$n_{H\beta}^{66.2}$ ^{32}

$C_{15}H_{14}$

9-Ethylfluorene



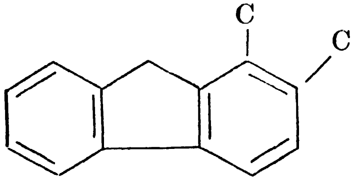
M. P., °C

108^{37}
$107\text{–}108^{35}$
$106\text{–}107^{28}$
105^{27}

B. P., °C @ 760mm

$306\text{–}310^{25}$	
170	18^{27}
169–171	14^{36}
165–166	13^{35}

1,2-Dimethylfluorene (a)

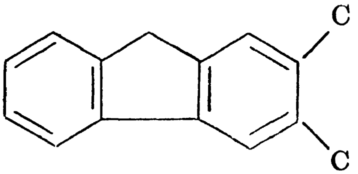


M. P., °C

$107\text{–}108^{10}$

(a) The structure of this compound was not clearly defined in the literature.

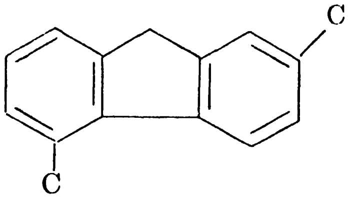
2,3-Dimethylfluorene



M. P., °C

$125\text{–}126^{1}$
$125^{1,9}$

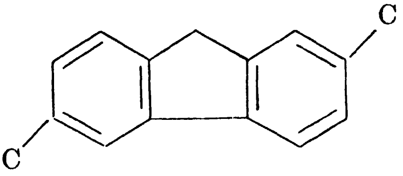
2,5-Dimethylfluorene



M. P., °C

$58\text{–}59^{24}$

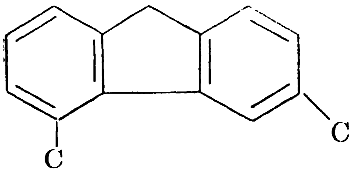
2,6-Dimethylfluorene



M. P., °C

$66\text{–}67^{15,16}$

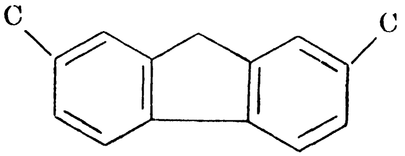
3,5-Dimethylfluorene



M. P., °C

$81\text{–}82^{16}$

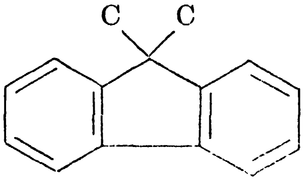
2,7-Dimethylfluorene



M. P., °C

$114\text{–}115^{16}$

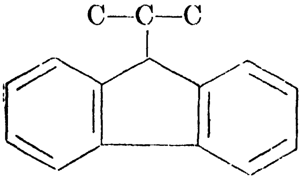
9,9-Dimethylfluorene



M. P., °C
70[2]

$C_{16}H_{16}$

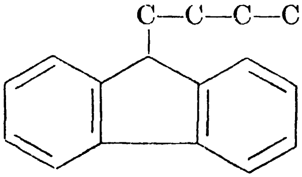
9-Isopropylfluorene



M. P., °C
54–55[4]
53–55[18]

$C_{17}H_{18}$

9-*n*-Butylfluorene



M. P., °C
101[28]

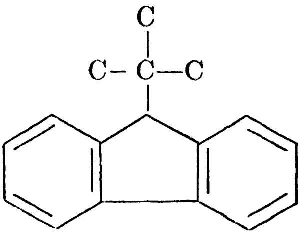
B. P., °C @ 760mm
192–195 33[28]

x-Isobutylfluorene (a)

M. P., °C
68–70[8]

(a) The structure of this compound was not clearly defined in the literature.

9-*tert*-Butylfluorene (a)

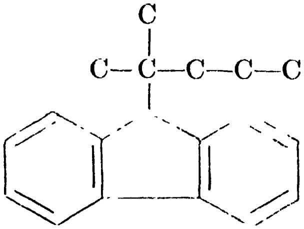


M. P., °C
101–102[6]
98–99[26]

(a) The structure of this compound was not clearly defined in the literature.

$C_{19}H_{22}$

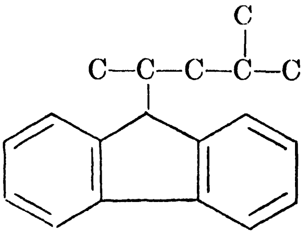
2-Methyl-2-(9′-fluoryl)-pentane (a)



M. P., °C
84–85[6, 7]

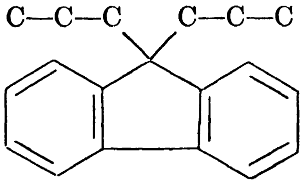
(a) The structure of this compound was not clearly defined in the literature.

2-Methyl-4-(9′-fluoryl)-pentane



M. P., °C
101–103[18]

9,9-Di-*n*-propylfluorene



M. P., °C
37–38[3]

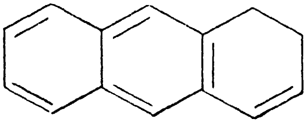
References on $C_{14}H_{12}$ through $C_{19}H_{22}$ Compounds

1. Alder, K., and H. F. Rickert, Ber. **71,** 379 **1938.**
2. Blum-Bergmann, O., Ann. **484,** 26 **1930.**
3. Bradsher, C. K., and S. T. Amore, J. Am. Chem. Soc. **65,** 2016 **1943.**
4. Brown, W. G., and B. A. Bluestein, J. Am. Chem. Soc. **65,** 1082 **1943.**
5. Ferrer, J., Anales soc. españ. fís. quím. **20,** 459 **1922;** Chem. Zentr. **1923,** III, 1161.
6. France, H., P. Maitland, and S. H. Tucker, J. Chem. Soc. **1937,** 1739.
7. France, H., S. H. Tucker, and J. Forrest, J. Chem. Soc. **1945,** 7.
8. Freund, M., K. Fleischer, and E. Stemmer, Ann. **414,** 1 **1918.**
9. Fujise, S., Ber. **71,** 2461 **1938.**
10. Ghigi, E., Ber. **70,** 2469 **1937.**
11. Hinkel, L. E., E. E. Ayling, and J. H. Beynon, J. Chem. Soc. **1936,** 339.
12. Hugel, G., and Gidaly, Bull. soc. chim. [4] **51,** 639 **1932.**
13. Krollpfeiffer, F., Ann. **430,** 161 **1923.**
14. Kruber, O., Ber. **65,** 1382 **1932.**
15. Longo, B., Atti accad. sci. Torino, Classe sci. fis., mat. nat. **73,** 434 **1938.**
16. Longo, B., Atti congr. intern. chim. Roma, 10th Congress **3,** 239 **1939.**
17. Lothrop, W. C., J. Am. Chem. Soc. **63,** 1187 **1941.**
18. Maitland, P., and S. H. Tucker, J. Chem. Soc. **1929,** 2559.
19. Mascarelli, L., and A. Angeletti, Atti accad. sci. Torino, Classe sci. fis., mat. nat. **72,** 115 **1936.**
20. Mascarelli, L., and B. Longo, Atti accad. Lincei [6] **26,** 292 **1937.**
21. Mascarelli, L., and B. Longo, Atti accad. sci. Torino, Classe sci. fis., mat. nat. **72,** 109 **1936.**
22. Mascarelli, L., and B. Longo, Gazz. chim. ital. **67,** 812 **1937.**
23. Mascarelli, L., and B. Longo, Gazz. chim. ital. **68,** 121 **1938.**
24. Mascarelli, L., and B. Longo, Gazz. chim. ital. **71,** 289 **1941.**
25. Mayer, F., Ber. **46,** 2579 **1913.**
26. McEwen, W. K., J. Am. Chem. Soc. **58,** 1124 **1936.**
27. Meerwein, H., Ann. **396,** 200 **1913.**
28. Miller, H. F., and J. Bachman, J. Am. Chem. Soc. **57,** 766 **1935.**
29. Orchin, M., and E. O. Woolfolk, J. Am. Chem. Soc. **67,** 122 **1945.**
30. Sieglitz, A., and H. Jassoy, Ber. **55,** 2032 **1922.**
31. Vansheidt, A., and B. Moldavski, Ber. **64,** 917 **1931.**
32. von Auwers, K., and A. Fruhling, Ann. **422,** 196 **1921.**
33. Vorlander, D., and A. Pritzsche, Ber. **46,** 1793 **1913.**
34. Wieland, H., F. Reindel, and J. Ferrer, Ber. **55,** 3313 **1922.**
35. Wislicenus, W., and A. Deusch, Ber. **35,** 759 **1902.**
36. Wislicenus, W., and W. Mocker, Ber. **46,** 2772 **1913.**
37. Zelinskiĭ, N. D., and M. V. Gaverdovskaya, Ber. **61,** 1049 **1928.**

5. DIHYDROANTHRACENES, DIHYDROPHENANTHRENES, AND THEIR ALKYL DERIVATIVES, C_nH_{2n-16}

$C_{14}H_{12}$

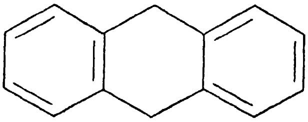
1,2-Dihydroanthracene



M. P., °C

150[79]

9,10-Dihydroanthracene



M. P., °C

108

111[18]

108–110[15]

108.0–109.8[58]

108–109[27]

107–109[71]

108.5[9, 52, 71, 82]

108 (a)

107–108[37, 45, 48]

106–108[63]

107[43, 74, 80]

106–107[14]

106–106.5[62]

106[25, 26, 66]

105[10]

104–105[53, 61]

B. P., °C @ 760mm

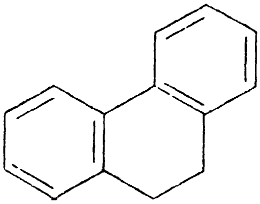
315[82]	
313[43]	
305[25]	
302–303[26]	
165–170	13[37]

D_4^{20}

0.88951	10.3° [62]

(a) The melting point 108 is found in references 32, 40, 41, 47, 49, 70, 75, 80, 81.

9,10-Dihydrophenanthrene



M. P., °C

96[78]

94–95[68, 69]

94[31, 60]

35[4]

34.5–35[65]

33.8–34.4[19]

32–33[22]

B. P., °C @ 760mm

314[31]	
312–314	740[68]
312–314	739[69]
212–213	60[12]
176–178	20[19]
158	11[65]
154	7.5[22]
140–142	6[19]

D_4^{20}

1.0940	24.5° [78]
1.0942	24.5° [78]

n_D^{20}

1.6406	25° [19]
1.62093	$n_{H\alpha}^{24.5}$ [78]
1.62128	$n_{H\alpha}^{24.5}$ [78]
1.65269	$n_{H\beta}^{24.5}$ [78]
1.65312	$n_{H\beta}^{24.5}$ [78]
1.62979	$n_{He}^{24.5}$ [78]
1.63015	$n_{He}^{24.5}$ [78]

---

x,x-Dihydrophenanthrene (a)

M. P., °C

34.5–35[72]

B. P., °C @ 760mm

168–170	15[67]
168–169	15[72]

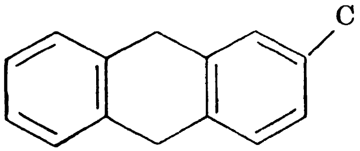
D_4^{20}

1.0757	40° [72]
1.0953	14° [72]

(a) The structure of this compound was not clearly defined in the literature.

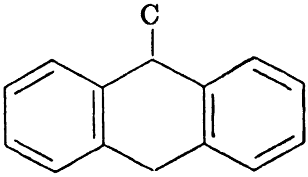
$C_{15}H_{14}$

2-Methyl-9,10-dihydroanthracene



M. P., °C
51[23]

9-Methyl-9,10-dihydroanthracene



M. P., °C
61.5–62[73]

1-Methyl-x,x-dihydroanthracene (a)

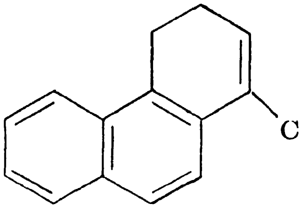
M. P., °C
30[24]

B. P., °C @ 760mm

314–315	740[24]

(a) The structure of this compound was not clearly defined in the literature.

1-Methyl-3,4-dihydrophenanthrene



M. P., °C
86.0–86.5[5]

$C_{16}H_{16}$

9-Ethyl-x,x-dihydroanthracene (a)

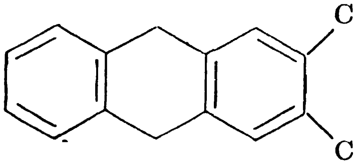
B. P., °C @ 760mm
320–323[45]
320[46]

D_4^{20}

1.049	D_{18}^{18} [45, 46]

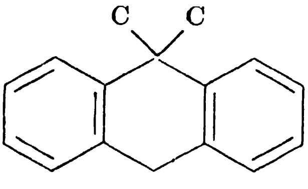
(a) The structure of this compound was not clearly defined in the literature.

2,3-Dimethyl-9,10-dihydroanthracene



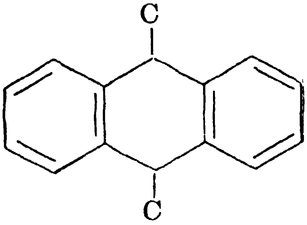
M. P., °C
122[8]

9,9-Dimethyl-9,10-dihydroanthracene



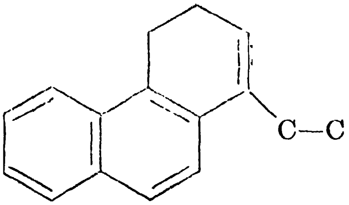
M. P., °C
56[28]

9,10-Dimethyl-9,10-dihydroanthracene



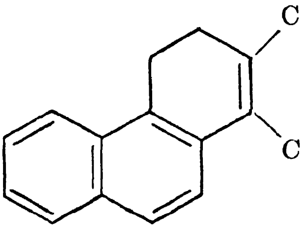
M. P., °C
181
181–182[3]
181–181.5[2]
181[16]
179–181[17]
178–179[1, 11]

1-Ethyl-3,4-dihydrophenanthrene



M. P., °C
42–43[5]

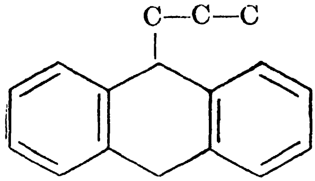
1,2-Dimethyl-3,4-dihydrophenanthrene



M. P., °C
99–100[30]

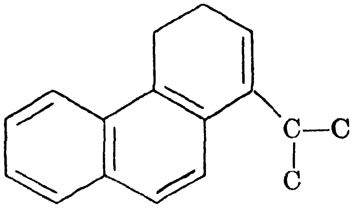
$C_{17}H_{18}$

9-*n*-Propyl-9,10-dihydroanthracene



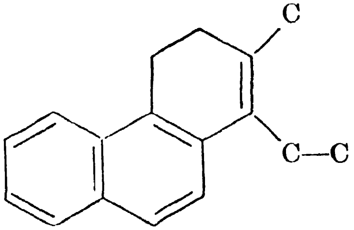
B. P., °C @ 760mm
175–176 11[73]

1-Isopropyl-3,4-dihydrophenanthrene



M. P., °C
66–67[5]

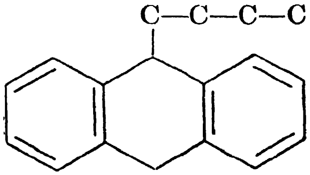
1-Ethyl-2-methyl-3,4-dihydrophenanthrene



M. P., °C
77–78[30]

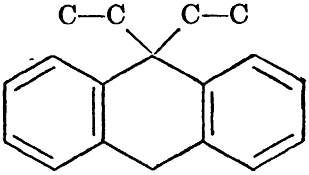
$C_{18}H_{20}$

9-*n*-Butyl-9,10-dihydroanthracene



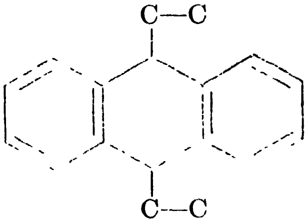
B. P., °C @ 760mm
191–192 11[73]

9,9-Diethyl-9,10-dihydroanthracene



M. P., °C
210^{36}

9,10-Diethyl-9,10-dihydroanthracene



D_4^{20}	
1.014^{64}	
1.0132	21° ^{44}

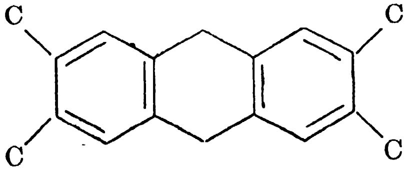
---

x,x-Diethyl-x,x-dihydroanthracene (a)

D_4^{20}	
0.9634	100° ^{21}
0.9949	50° ^{21}
1.0264	0° ^{21}

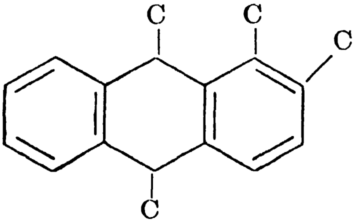
(a) The structure of this compound was not clearly defined in the literature.

2,3,6,7-Tetramethyl-9,10-dihydroanthracene



B. P., °C @ 760mm
$217\text{–}219^{54}$

1,2,9,10-Tetramethyl-9,10-dihydroanthracene



M. P., °C
$100\text{–}101^{7}$

1,3,5,7-Tetramethyl-x,x-dihydroanthracene (a)

M. P., °C
$132\text{–}133^{83}$

(a) The structure of this compound was not clearly defined in the literature.

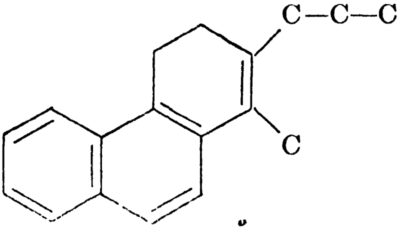
---

x_4-Tetramethyl-x,x-dihydroanthracene (a)

M. P., °C
$171\text{–}171.5^{3}$
$170.5\text{–}171^{3}$

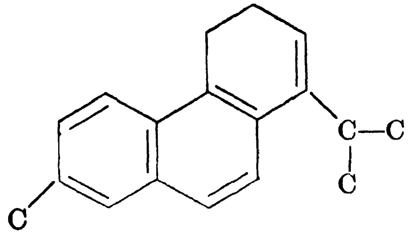
(a) The structure of this compound was not clearly defined in the literature.

1-Methyl-2-*n*-propyl-3,4-dihydrophenanthrene



B. P., °C @ 760mm
208–210 13^{39}

1-Isopropyl-7-methyl-3,4-dihydrophenanthrene



B. P., °C @ 760mm

150	2[59]

1-Methyl-7-isopropyl-x,x-dihydrophenanthrene (a)

M. P., °C

64–65[38, 55, 76]

B. P., °C @ 760mm

375–376[57]	
188–190	10[76]

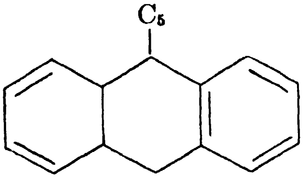
D_4^{20}

1.027[57]

(a) The structure of this compound was not clearly defined in the literature.

$C_{19}H_{22}$

9-Isopentyl-9,10-dihydroanthracene



B. P., °C @ 760mm

200	23[77]
201–205	17[77]

D_4^{20}

1.016[77]	
1.025[77]	
1.0022	45.1° [77]
0.9940	44.4° [77]

n_D^{20}

1.5736[77]	
1.5771[77]	
1.56584	45.1° [77]
1.56261	44.4° [77]
1.56091	$n_{H\alpha}^{45.1}$ [77]
1.55791	$n_{H\alpha}^{44.4}$ [77]
1.58047	$n_{H\beta}^{45.1}$ [77]
1.57651	$n_{H\beta}^{44.4}$ [77]
1.58868	$n_{H\gamma}^{44.4}$ [77]

---

x-Pentyl-x,x-dihydroanthracene (a)

B. P., °C @ 760mm

350[46]	
291–292	570[46]

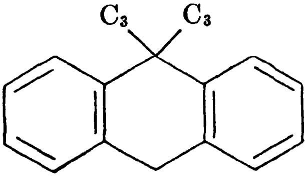
D_4^{20}

1.031	18° [46]

(a) The structure of this compound was not clearly defined in the literature.

$C_{20}H_{24}$

9,9-Dipropyl-9,10-dihydroanthracene



M. P., °C

46–47[29]

---

x,x-Diisopropyl-9,10-dihydroanthracene (a)

M. P., °C

90[20]

(a) The structure of this compound was not clearly defined in the literature.

1-Methyl-4-ethyl-7-isopropyl-x,x-dihydrophenanthrene (a)

M. P., °C

51–52.5[55]
51–52[55]
51[56]

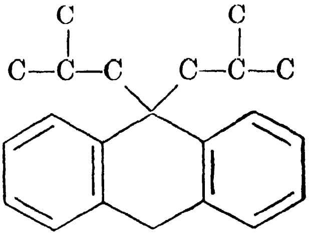
B. P., °C @ 760mm

223–225 7.5[56]

(a) The structure of this compound was not clearly defined in the literature.

$C_{22}H_{28}$

9,9-Diisobutyl-9,10-dihydroanthracene



M. P., °C

97–98[50]

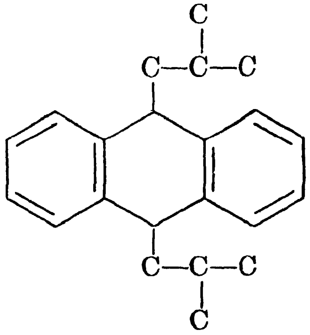
B. P., °C @ 760mm

140–143 0.01[50]

n_D^{20}

1.5595[50]

9,10-Diisobutyl-9,10-dihydroanthracene



B. P., °C @ 760mm

142 0.5[42]

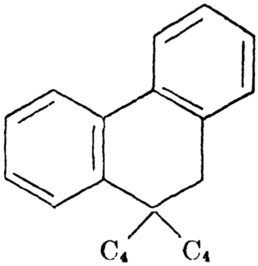
D_4^{20}

0.9899[42]
0.9902[51]

n_D^{20}

1.56336[42]
1.55830 $n_{H\alpha}^{20}$ [42]
1.57600 $n_{H\beta}^{20}$ [42]

9,9-Dibutyl-9,10-dihydrophenanthrene



M. P., °C

76[13]

---

x,x-Diisobutyl-x,x-dihydrophenanthrene (a)

D_4^{20}

0.9305 23° [34]

(a) The structure of this compound was not clearly defined in the literature.

1-Methyl-x,x-diethyl-7-isopropyl-x,x-dihydrophenanthrene (a)

B. P., °C @ 760mm

238–241 9 [55]

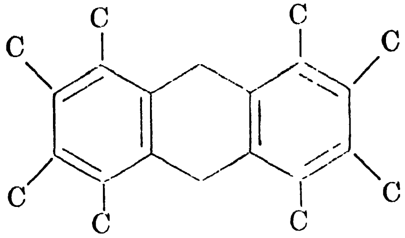
D_4^{20}

1.0055[55]

(a) The structure of this compound was not clearly defined in the literature.

$C_{22}H_{28}$

1,2,3,4,5,6,7,8-Octamethyl-9,10-dihydroanthracene

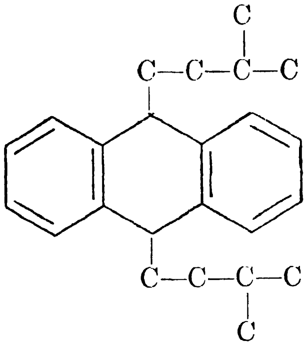


M. P., °C

283–284[6]

$C_{24}H_{32}$

9,10-Di-(3′-methylbutyl)-9,10-dihydroanthracene



D_4^{20}

0.9720	
0.972[64]	
0.9130	100°[21]
0.9499	50°[21]
0.9713	21°[35]
0.9868	0°[35]

n_D^{20}

1.5640	25°[64]
1.5670	10°[35]

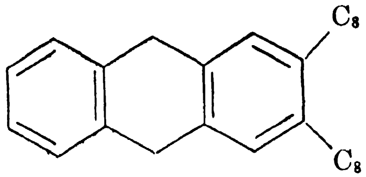
Additional Data

$$\frac{dD}{dt} = -0.0007380/°C$$

(0 to 100 °C)

$C_{30}H_{44}$

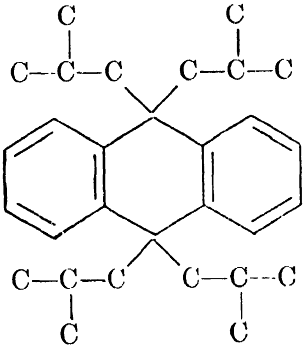
2,3-Dioctyl-9,10-dihydroanthracene



D_4^{20}

0.948[64]	
0.9016	100°[21]
0.9331	50°[21]
0.9646	0°[21]

9,9,10,10-Tetraisobutyl-9,10-dihydroanthracene



M. P., °C

177.5[42]

n_D^{20}

1.548 (a)	$n_{H\alpha}$[50]
1.603 (a)	$n_{H\gamma}$[50]

(a) The temperature of this determination was not given.

$C_{34}H_{52}$

x_4-Tetraisoamyl-x,x-dihydroanthracene (a)

M. P., °C

168–170[33]

(a) The structure of this compound was not clearly defined in the literature.

References on Dihydroanthracenes, Dihydrophenanthrenes, and Their Alkyl Derivatives

1. Angelbis, A., and R. Anschütz, Ber. **17,** 165 **1884.**
2. Anschütz, R., Ann. **235,** 299 **1886.**
3. Anschütz, R., and E. Romig, Ber. **18,** 662 **1885.**
4. Askew, F. A., J. Chem. Soc. **1935,** 512.
5. Bachmann, W. E., and A. L. Wilds, J. Am. Chem. Soc. **60,** 624 **1938.**
6. Backer, H. J., J. Strating, and L. H. H. Huisman, Rec. trav. chim. **58,** 761 **1939.**
7. Badger, G. M., F. Goulden, and F. H. Warren, J. Chem. Soc. **1941,** 18.
8. Baker, W., R. Banks, D. R. Lyon, and F. G. Mann, J. Chem. Soc. **1945,** 27.
9. Bamberger, E., and W. Lodter, Ber. **20,** 3073 **1887.**
10. Blum-Bergmann, O., Ann. **484,** 26 **1930.**
11. Boeseken, J., and M. C. Bastet, Rec. trav. chim. **32,** 184 **1913.**
12. Burger, A., and E. Mosettig, J. Am. Chem. Soc. **58,** 1857 **1936.**
13. Chu, E. J. H., and Z.-I. Shen, J. Chinese Chem. Soc. **10,** 116 **1943;** C. A. **38,** 2953 **1943.**
14. Clemmensen, E., Ber. **47,** 681 **1914.**
15. Cook, J. W., J. Chem. Soc. **1926,** 1677.
16. Cook, J. W., and V. J. Chambers, J. Am. Chem. Soc. **43,** 331 **1921.**
17. Davidson, J. M., and A. Lowy, J. Am. Chem. Soc. **51,** 2978 **1929.**
18. Dufraisse, C., L. Velluz, and Mme. L. Velluz, Bull. soc. chim. [5] **5,** 1073 **1938.**
19. Durland, J. R., and H. Adkins, J. Chem. Soc. **59,** 135 **1937.**
20. Errera, G., Gazz. chim. ital. **14,** 277 **1884.**
21. Evans, E. B., J. Inst. Petroleum Tech. **24,** 537 **1938.**
22. Fieser, L. F., and W. S. Johnson, J. Am. Chem. Soc. **61,** 168 **1939.**
23. Fischer, O., and K. Reinkober, J. prakt. Chem. [2] **92,** 49 **1915.**
24. Fischer, O., and H. Ziegler, J. prakt. Chem. [2] **86,** 289 **1912.**
25. Graebe, C., and C. Liebermann, Ann. suppl. **7,** 257 **1870.**
26. Graebe, C., and C. Liebermann, Ber. **1,** 49, 104, 186 **1868.**
27. Grimm, H. G., M. Günther, and H. Tittus, Z. physik. Chem. **14B,** 169 **1931.**
28. Hallgarten, F., Ber. **21,** 2508 **1888.**
29. Hallgarten, F., Ber. **22,** 1069 **1889.**
30. Haworth, R. D., C. R. Mavin, and G. Sheldrick, J. Chem. Soc. **1934,** 454.
31. Henstock, H., J. Chem. Soc. **119,** 1461 **1921.**
32. Hugel, G., and J. Friess, Ann. combustibles liquides **6,** 1109 **1931.**
33. Hugel, G., and M. Lerer, Bull. soc. chim. [4] **53,** 1498 **1933.**
34. Hugel, G., and M. Lerer, Bull. soc. chim. [4] **53,** 1502 **1933.**
35. Hugel, G., and M. Lerer, Compt. rend. **195,** 249 **1932.**
36. Kehrmann, F., R. Monier, and M. Ramm, Ber. **56,** 169 **1923.**
37. Klepper, J., Compt. rend. Congr. chim. ind. **8,** 261 **1929.**
38. Komppa, G., and H. P. Fogelberg, J. Am. Chem. Soc. **54,** 2900 **1932.**
39. Kon, G. A. R., E. S. Narracott, and C. Reid, J. Chem. Soc. **1938,** 778.
40. Kovache, A., and E. Tricot, Chimie & industrie **13,** 361, 537 **1925.**
41. Krollpfeiffer, F., Ann. **430,** 161 **1923.**
42. Larsen, R. G., R. E. Thorpe, and F. A. Armfield, Ind. Eng. Chem. **34,** 183 **1942.**
43. Lebeau, P., and M. Picon, Compt. rend. **159,** 70 **1914.**
44. Lerer, M., Ann. combustibles liquides **8,** 681 **1933.**
45. Liebermann, C., Ann. **212,** 1 **1882.**
46. Liebermann, C., and L. Landshoff, Ber. **14,** 455 **1881.**
47. Liebermann, C., and Topf, Ber. **9,** 1201 **1876.**
48. Mameli, E., and A. Mossini, Giorn. chim. ind. applicata **15,** 161 **1933.**
49. Manzoni-Ansidei, R., Gazz. chim. ital. **67,** 790 **1937.**
50. Martin, E., Ann. combustibles liquides **12,** 97 **1937.**
51. Martin, E., and M. G. Hugel, Bull. soc. chim. [4] **53,** 1500 **1933.**

52. Michael, A., and A. Thal, Ber. **47**, 473 **1914**.

53 Miller, H. F., and J. Bachman, J. Am. Chem. Soc. **57**, 766 **1935**.

54. Morgan, G. T., and E. A. Coulson, J. Chem. Soc. **1931**, 2323.

55. Nyman, G. A., Ann. Acad. Sci. Fennicae **41**, No. 5, **1935**, 74 pp.; Chem. Zentr. **1936**, I, 2348.

56. Nyman, G. A., Ann. Acad. Sci. Fennicae, **48A**, No. 6, **1938**, 32 pp.; C. A. **33**, 8192 **1939**; Chem. Zentr. **1939**, II, 3118.

57. Olsson, J., Ing. Vetenskaps Akad. Handl. **1931**, No. 111, 27 pp.; Chem. Zentr. **1931**, II, 3420.

58. Orchin, M., J. Am. Chem. Soc. **66**, 535 **1944**.

59. Orcutt, R. M., and M. T. Bogert, J. Am. Chem. Soc. **63**, 127 **1941**.

60. Padoa, M., Atti accad. Lincei [5] **28**, II, 239 **1919**.

61. Padova, R., Ann. chim. phys. [8] **19**, 353 **1910**.

62. Pellini, G., Gazz. chim. ital. **31**, I, 1 **1901**.

63. Perkin, A. G., J. Chem. Soc. **59**, 634 **1891**.

64. Rossini, F. D., Refiner Natural Gasoline Mfr. **14**, 268 **1935**.

65. Ruggli, P., and A. Staub, Helv. Chim. Acta **20**, 37 **1937**.

66. Sachse, H., Ber. **21**, 2512 **1888**.

67. Schlenk, W., and E. Bergmann, Ann. **463**, 1 **1928**.

68. Schmidt, J., and E. Fischer, Ber. **41**, 4225 **1908**.

69. Schmidt, J., and R. Mezger, Ber. **40**, 4240 **1907**.

70. Scholl, R., and C. Seer, Ber. **55**, 330 **1922**.

71. Schroeter, G., Ber. **57**, 2003 **1924**.

72. Schroeter, G., H. Müller, and J. Y. S. Huang, Ber. **62**, 645 **1929**.

73. Sieglitz, A., and R. Marx, Ber. **56**, 1619 **1923**.

74. Sugino, K., and K. Outi, J. Chem. Soc. Japan **62**, 401 **1941**; C. A. **37**, 4726 **1943**.

75. Ullman, F., Ann. **291**, 17 **1896**.

76. Virtanen, A. J., Ber. **53**, 1880 **1920**.

77. von Auwers, K., Ber. **53**, 941 **1920**.

78. von Auwers, K., and R. Kraul, Ann. **443**, 181 **1925**.

79. von Braun, J., and O. Bayer, Ann. **472**, 90 **1929**.

80. von Braun, J., and O. Bayer, Ber. **58**, 2667 **1925**.

81. von Perger, H. R., J. prakt. Chem. [2] **23**, 137 **1881**.

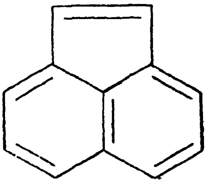
82. Waser, E., Helv. Chim. Acta **8**, 758 **1925**.

83. Weiler, N., Ber. **33**, 464 **1900**.

6. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-16}

$C_{12}H_8$

Acenaphthylene



M. P., °C

93

93–94^{30}

93$^{14, 29}$

92–93 (a)

92$^{31, 44}$

B. P., °C @ 760mm

270^{44}

236^{27}

175.5–176.5^{35}

D_4^{20}

0.88469 15.05° ^{56}

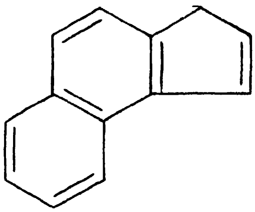
Additional Data

Sublimation Temp. (°C) 86.5° ^{38}

(a) The melting point 92–93 is found in references 5, 6, 9, 13, 32, 33, 52, 55, 56.

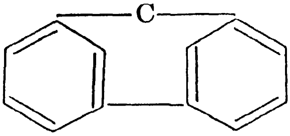
$C_{13}H_{10}$

4,5-Benzoindene



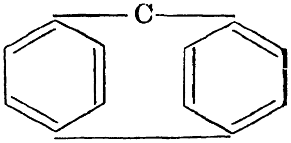
M. P., °C
48.5–50[49]
B. P., °C @ 760mm
173 33[49]

3,3′-Diphenylenemethane



M. P., °C
118[15]
B. P., °C @ 760mm
295[15]

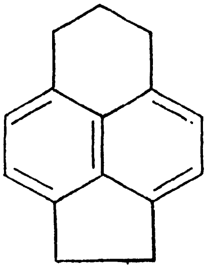
4,4′-Diphenylenemethane



M. P., °C
208[15, 54]
B. P., °C @ 760mm
320[54]

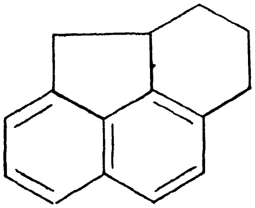
$C_{15}H_{14}$

Cyclopentano-[gh]-phenalan



M. P., °C
122[12]
B. P., °C @ 760mm
168–170 1–3[12]

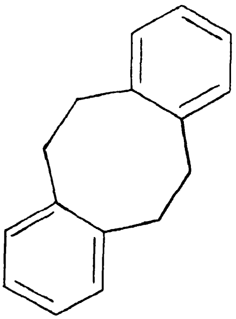
Cyclopentano-[def]-1,2,3,4-tetrahydrophenanthrene



M. P., °C
54.5–55.5[1]

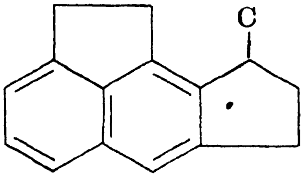
$C_{16}H_{16}$

1,2,5,6-Dibenzocyclooctane



M. P., °C
108.5[3]

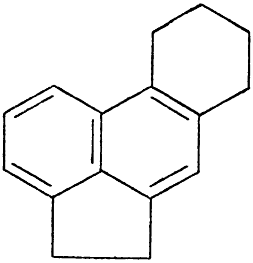
3,4-(3′-Methylcyclopentano)-acenaphthene



M. P., °C
38–38.5[34]

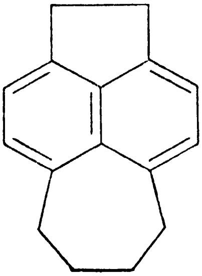
B. P., °C @ 760mm
143–148 1[34]

Cyclopentano-[jk]-1,2,3,4-tetrahydrophenanthrene



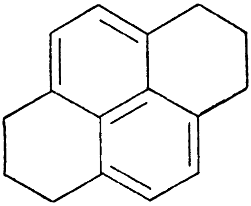
M. P., °C
92.5[37]

Cycloheptano-[fg]-acenaphthene



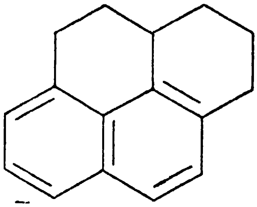
M. P., °C
138[36]

1,2,3,6,7,8-Hexahydropyrene



M. P., °C
133[41]
131–132[47]
129–130[51]
129[57]
127[43, 45]

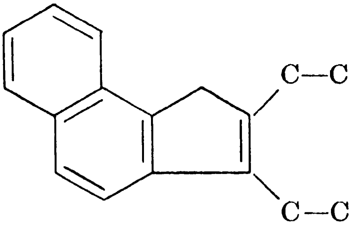
1,2,3,9,10,10a-Hexahydropyrene



M. P., °C
106[26]
105–105.5[22]

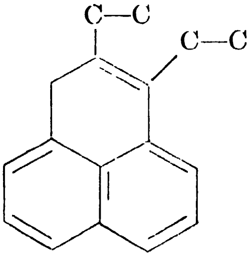
$C_{17}H_{18}$

2,3-Diethyl-6,7-benzoindene



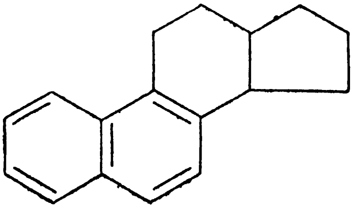
B. P., °C @ 760mm
205–207 16[53]

2,3-Diethylphenalene



B. P., °C @ 760mm
185 13[53]

1,2-Cyclopentano-1,2,3,4-tetrahydrophenanthrene



M. P., °C
133–134.5[20]

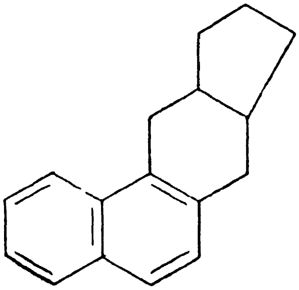
B. P., °C @ 760mm
160–161 (a) 3–4[20]

D_4^{20}
1.0859 (a)[20]

n_D^{20}
1.6256 (a) 20.2° [20]

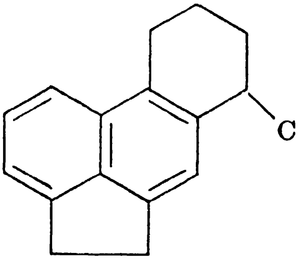
(a) This constant was determined on the *trans* isomer of the compound.

2,3-Cyclopentano-1,2,3,4-tetrahydrophenanthrene



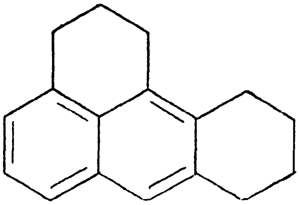
M. P., °C
119–121[8]

Cyclopentano-[jk]-1-methyl-1,2,3,4-tetrahydrophenanthrene



M. P., °C
133[37]

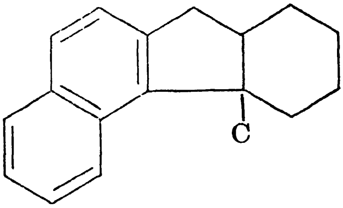
4,5-Cyclohexanophenalan



B. P., °C @ 760mm
228–230 16[59]

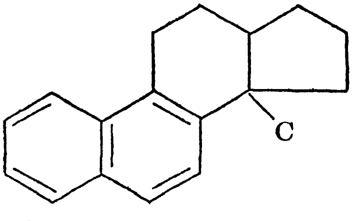
$C_{18}H_{20}$

4a-Methyl-5,6-benzo-1,2,3,4,4a,9a-hexahydrofluorene



B. P., °C @ 760mm
200–205 7[17]

1-Methyl-1,2-cyclopentano-1,2,3,4-tetrohydrophenanthrene

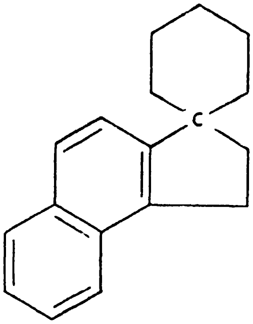


B. P., °C @ 760mm
155 0.4[46]

D_4^{20}
1.0692[50]
1.04552 18.9° [46]

n_D^{20}
1.6176[50]
1.61363 18.9° [46]

Spiro[4,5-benzoindane-1,1′-cyclohexane]



M. P., °C
56–57[16]

B. P., °C @ 760mm
140 0.1[16]

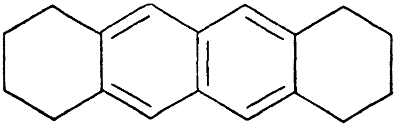
---

x_8-Octahydro-1,2-benzoanthracene (a)

M. P., °C
124.5–125.5[24]

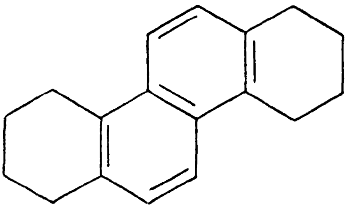
(a) The structure of this compound was not clearly defined in the literature.

1,2,3,4,7,8,9,10-Octahydronaphthacene



M. P., °C
174[60]

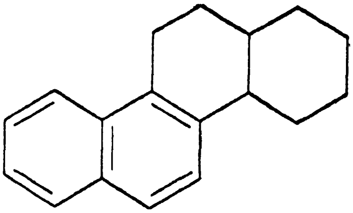
1,2,3,4,7,8,9,10-Octahydrochrysene



M. P., °C
138–140[61]
136–138[16]

B. P., °C @ 760mm
180–181 0.2[61]

1,2,3,4,4a,11,12,12a-Octahydrochrysene

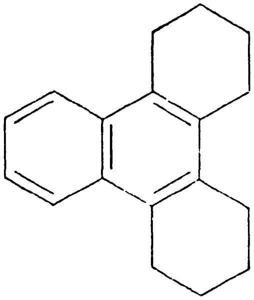


M. P., °C
114–114.5 (a)[21]
78–79 (b)[21]

(a) This constant was determined on the *trans* isomer of the compound.

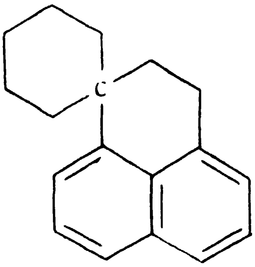
(b) This constant was determined on the *cis* isomer of the compound.

1,2,3,4,5,6,7,8-Octahydrotriphenylene



M. P., °C
117.5–119.5[2]

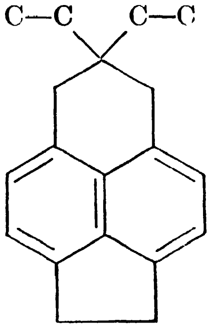
Spiro[phenalan-1,1′-cyclohexane]



M. P., °C
55–56[21]
B. P., °C @ 760mm
176–177[21]
D_4^{20}
1.0809 23.5° [21]
n_D^{20}
1.6197 23.6° [21]

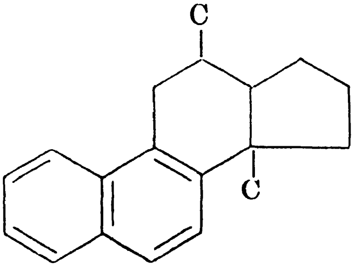
$C_{19}H_{22}$

Cyclopentano-[gh]-2,2-diethylphenalan



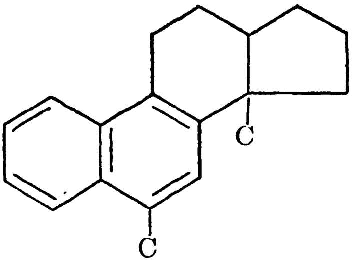
M. P., °C
93–95[39, 40]

1,2-Cyclopentano-1,3-dimethyl-1,2,3,4-tetrahydrophenanthrene



B. P., °C @ 760mm
160 0.4[46]
D_4^{20}
1.04203 18.2° [46]
n_D^{20}
1.60681 18.2° [46]

1,2-Cyclopentano-1,9-dimethyl-1,2,3,4-tetrahydrophenanthrene



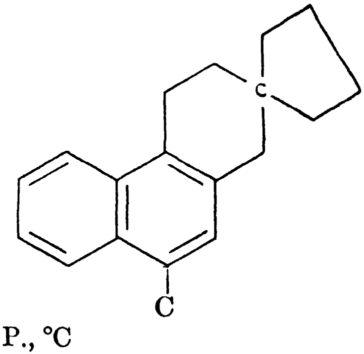
B. P., °C @ 760mm
160 0.5[42]

Spiro[x-methyl-5,6-benzoindane-1,1′-cyclohexane] (a)

M. P., °C
109–110[23]

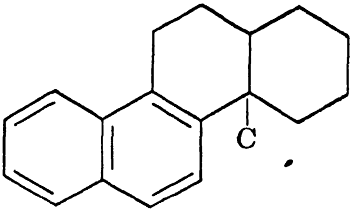
(a) The structure of this compound was not clearly defined in the literature.

Spiro[9-methyl-1,2,3,4-tetrahydrophenanthrene-2,1′-cyclopentane]



M. P., °C
69–70[58]

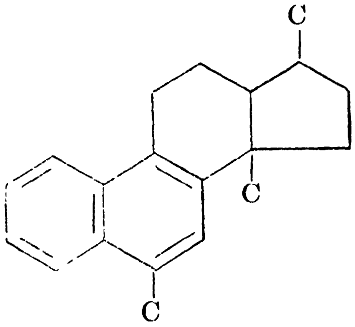
4a-Methyl-1,2,3,4,4a,11,12,12a-octahydrochrysene



B. P., °C @ 760mm
145 0.1[19]

$C_{20}H_{24}$

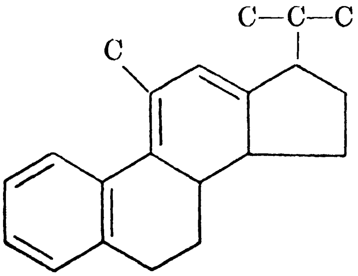
1,2-(3′-Methylcyclopentano)-1,9-dimethyl-1,2,3,4-tetrahydrophenanthrene



B. P., °C @ 760mm
170 0.6[42]

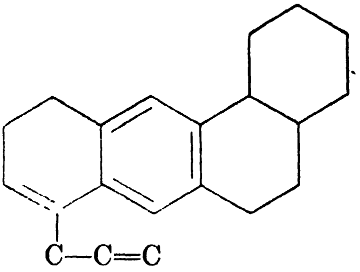
$C_{21}H_{26}$

1,2-(3′-Isopropylcyclopentano)-4-methyl-1,9,10,10a-tetrahydrophenanthrene



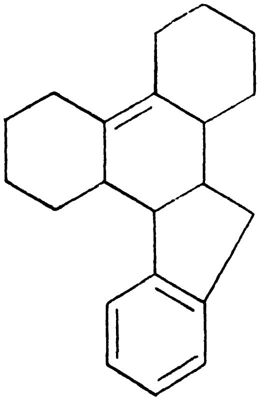
B. P., °C @ 760mm
190 0.1[10]

1,2-Cyclohexano-5-(propen-2′-yl)-1,2,3,4,7,8-hexahydroanthracene



B. P., °C @ 760mm
174 0.1[18]

9,10-(1′,2′-Indano)-1,2,3,4,5,6,7,8,8a,9,10,10a-dodecahydrophenanthrene



B. P., °C @ 760mm
185–190 (a)[7]
180–185 (a)[7]

(a) These constants were determined on isomeric forms.

$C_{22}H_{28}$

x-Methyl-x-isopropyl-x_8-octahydrochrysene (a)

M. P., °C
108[25]

(a) The structure of this compound was not clearly defined in the literature.

x_{14}-Tetradecahydropicene (a)

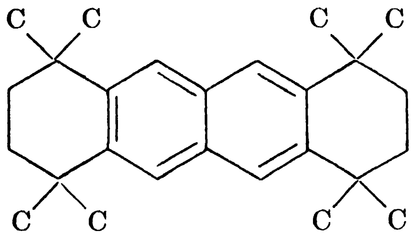
M. P., °C

285[4]

(a) The structure of this compound was not clearly defined in the literature.

$C_{26}H_{36}$

1,1,4,4,7,7,10,10-Octamethyl-1,2,3,4,7,8,9,10-octahydronaphthacene



M. P., °C

319-320[11]

$C_{33}H_{50}$

3-Phenyl-5-cholestene (a)

M. P., °C

152[48]

(a) The structure of this compound was not clearly defined in the literature.

Phenylcholestane (a)

M. P., °C

153[48]

(a) The structure of this compound was not clearly defined in the literature.

$C_{35}H_{54}$

3-Phenylcholestene-3 (a)

M. P., °C

94-95[28]

(a) The structure of this compound was not clearly defined in the literature.

References on Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-16}

1. Bachmann, W. E., and J. C. Sheenan, J. Am. Chem. Soc. **63,** 204 **1941.**
2. Bachmann, W. E., and W. S. Struve, J. Org. Chem. **4,** 472 **1939.**
3. Baker, W., R. Banks, D. R. Lyon, and F. G. Mann, J. Chem. Soc. **1945,** 27.
4. Bamberger, E., and F. D. Chattaway, Ann. **284,** 52 **1895.**
5. Behr, A., and W. A. van Dorp, Ann. **172,** 263 **1874.**
6. Behr, A., and W. A. van Dorp, Ber. **6,** 753 **1873.**
7. Bergmann, E., and F. Bergmann, J. Am. Chem. Soc. **60,** 1805 **1938.**
8. Bergmann, E., and O. Blum-Bergmann, J. Am. Chem. Soc. **59,** 1572 **1937.**
9. Billows, E., Riv. min. crist. ital. **26,** 5 **1901.**
10. Birch, A. J., and R. Robinson, J. Chem. Soc. **1944,** 503.
11. Bruson, H. A., and J. W. Kroeger, J. Am. Chem. Soc. **62,** 36 **1940.**
12. Buu-Hoï, and P. Cagniant, Compt. rend. **214,** 493 **1942;** C. A. **37,** 2370 **1943.**
13. Campbell, A. W., N. H. Cromwell, and J. J. Hager, J. Am. Chem. Soc. **58,** 1051 **1936.**
14. Campbell, B., J. Chem. Soc. **107,** 918 **1915.**
15. Carnelley, T., J. Chem. Soc. **37,** 701 **1880.**
16. Cohen, A., J. W. Cook, and C. L. Hewett, J. Chem. Soc. **1935,** 1633.
17. Cook, J. W., A. Dansi, C. L. Hewett, J. Iball, W. V. Mayneord, and E. Roe, J. Chem. Soc. **1935,** 1319.
18. Cook, J. W., and G. A. D. Haslewood, J. Chem. Soc. **1935,** 767.
19. Cook, J. W., G. A. D. Haslewood, and A. N. Robinson, J. Chem. Soc. **1935,** 667.
20. Cook, J. W., and C. L. Hewett, J. Chem. Soc. **1933,** 1098.

21. Cook, J. W., and C. L. Hewett, J. Chem. Soc. **1934,** 365.
22. Cook, J. W., C. L. Hewett, and I. Hieger, J. Chem. Soc. **1933,** 395.
23. Cook, J. W., C. L. Hewett, and A. M. Robinson, J. Chem. Soc. **1939,** 168.
24. Cook, J. W., and C. A. Lawrence, J. Chem. Soc. **1937,** 817.
25. Cook, J. W., and A. M. Robinson, J. Chem. Soc. **1938,** 505.
26. Coulson, E. A., J. Chem. Soc. **1937,** 1298.
27. Criegee, R., Ann. **522,** 75 **1936.**
28. Dansi, A., Gazz. chim. ital. **68,** 273 **1938.**
29. Dziewoński, K., and L. Gizler, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1937A,** 441; Chem. Zentr. **1938,** I, 1352.
30. Dziewoński, K., and Z. Leyko, Bull. intern. acad. sci. Cracovie **1916A,** 159.
31. Dziewoński, K., and G. Rapalski, Ber. **45,** 2491 **1912.**
32. Dziewoński, K., and T. Stolyhwo, Ber. **57,** 1531 **1924.**
33. Dziewoński, K., and T. Stolyhwo, Bull. intern. acad. sci. Cracovie **1924A,** 159.
34. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **61,** 1272 **1939.**
35. Fieser, L. F., and M. S. Newman, J. Am. Chem. Soc. **57,** 1602 **1935.**
36. Fieser, L. F., and M. A. Peters, J. Am. Chem. Soc. **54,** 4347 **1932.**
37. Fieser, L. F., and M. A. Peters, J. Am. Chem. Soc. **54,** 4373 **1932.**
38. Fischer, F., H. Schrader, and W. Meyer, Ges. Abhandl. Kenntnis Kohle **5,** 413 **1920.**
39. Fleischer, K., and F. Seifert, Ann. **422,** 317 **1921.**
40. Fleischer, K., and P. Wolff, Ber. **53,** 925 **1920.**
41. Fromherz, H., L. Thaler, and G. Wolf, Z. Elektrochem. **49,** 387 **1943.**
42. Gamble, D. J. C., and G. A. R. Kon, J. Chem. Soc. **1935,** 443.
43. Goldschmiedt, G., Ann. **351,** 218 **1907.**
44. Goswami, M. N., Compt. rend. **179,** 1269 **1924.**
45. Graebe, C., Ann. **158,** 285 **1871.**
46. Harper, S. H., G. A. R. Kon, and F. C. J. Ruzicka, J. Chem. Soc. **1934,** 124.
47. Kagehira, I., Bull. Chem. Soc. Japan **6,** 241 **1931.**
48. Kawasaki, C., and J. Yamamura, J. Pharm. Soc. Japan **58,** 606 **1938;** C. A. **32,** 8432 **1938;** Chem. Zentr. **1939,** II, 646.
49. Koelsch, C. F., and R. A. Scheiderbauer, J. Am. Chem. Soc. **65,** 2311 **1943.**
50. Kon, G. A. R., and E. S. Narracott, J. Chem. Soc. **1938,** 672.
51. Langstein, E., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse, Abt. IIb, **119,** 675 **1910.**
52. Mameli, E., and A. Mossini, Giorn. chim. ind. applicata **15,** 161 **1933.**
53. Mayer, F., and A. Sieglitz, Ber. **55,** 1835 **1922.**
54. Meyer, H., and A. Hoffmann, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **125–126,** Abt. IIb, 449 **1916–1917.**
55. Monti, L., Gazz. chim. ital. **68,** 608 **1938.**
56. Pellini, G., Gazz. chim. ital. **31,** I, 1 **1901.**
57. Pestemer, M., and F. Manchen, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **145,** Abt. IIb, 312 **1936.**
58. Sen-Gupta, S. C., Current Sci. **5,** 295 **1936;** C. A. **31,** 2587 **1937.**
59. von Braun, J., and O. Bayer, Ber. **58,** 2667 **1925.**
60. von Braun, J., O. Bayer, and L. F. Fieser, Ann. **459,** 287 **1927.**
61. von Braun, J., and G. Irmisch, Ber. **65,** 883 **1932.**

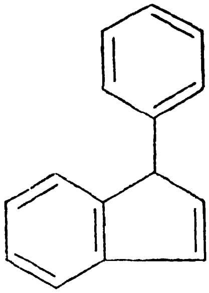
VI. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-18}

1. Indene with One Phenyl Substitution
2. Anthracene and Its Alkyl Derivatives
3. Phenanthrene and Its Alkyl Derivatives
4. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-18}

1. INDENE WITH ONE PHENYL SUBSTITUTION, C_nH_{2n-18}

$C_{15}H_{12}$

1-Phenylindene



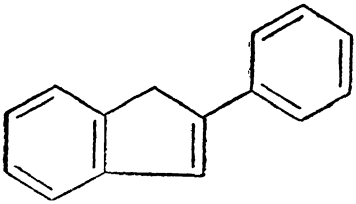
B. P., °C @ 760mm

200–201	29^{19}

D_4^{20}

1.0829	27°^{19}

2-Phenylindene



M. P., °C

167^{20}

$166–167^{6}$

B. P., °C @ 760mm

167–170	12^{15}
162–163	10^{20}

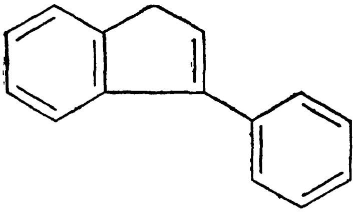
D_4^{20}

1.0821	16°^{20}

n_D^{20}

1.5955	16°^{20}

3-Phenylindene



B. P., °C @ 760mm

164–167	12^{5}
167–171	10^{6}

---

x-Phenylindene (a)

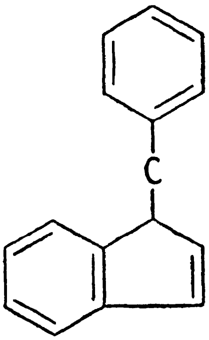
B. P., °C @ 760mm

183–187	17^{4}

(a) The structure of this compound was not clearly defined in the literature.

$C_{16}H_{14}$

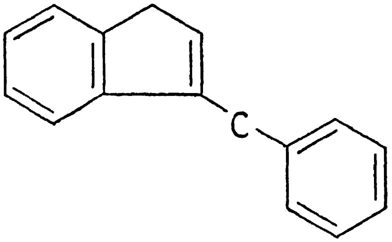
1-Benzylindene



B. P., °C @ 760mm

230–235	15^{14}
175–177	14^{9}
173–175	12^{9}

3-Benzylindene



M. P., °C

35[22]

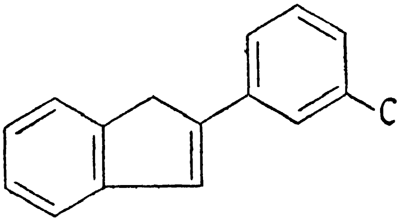
34[9, 10]

33–34[21]

B. P., °C @ 760mm

185	18[21]
175–177	14[10]
183–185	13[17]
179	11[22]

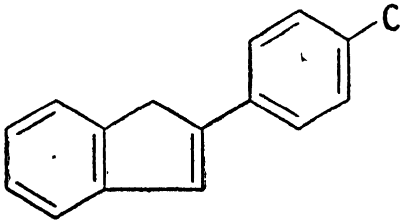
2-*m*-Tolylindene



M. P., °C

99–100[20]

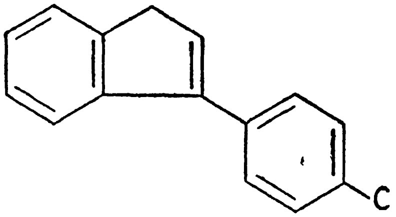
2-*p*-Tolylindene



M. P., °C

183–184[20]

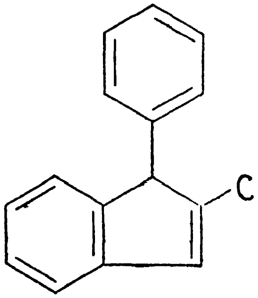
3-*p*-Tolylindene



B. P., °C @ 760mm

184–188	11[20]

1-Phenyl-2-methylindene



M. P., °C

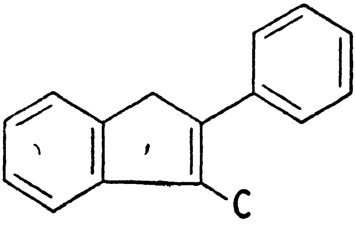
57.5[15]

56.5[23]

B. P., °C @ 760mm

177	14[15]

2-Phenyl-3-methylindene



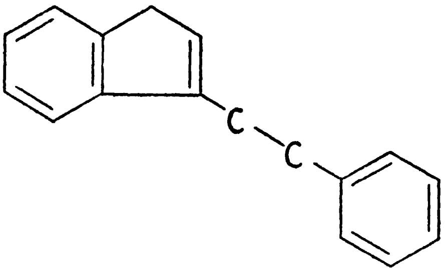
M. P., °C

76–78[6]

75–76[1]

$C_{17}H_{16}$

3-Phenethylindene



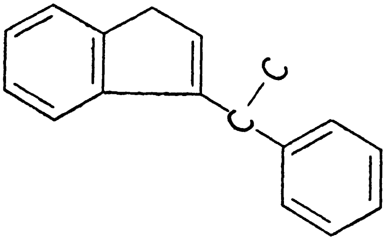
B. P., °C @ 760mm

186	9[7]

n_D^{20}

1.5987	18.7° [7]

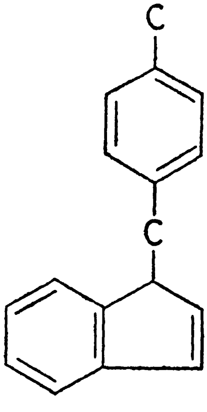
(3-Indenyl)-phenylmethylmethane



B. P., °C @ 760mm

196	15[18]
161	5[18]

1-(4′-Methylbenzyl)-indene



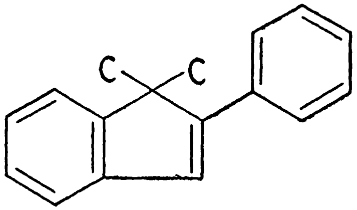
M. P., °C

27–29[3]

B. P., °C @ 760mm

218–222	12[3]

1,1-Dimethyl-2-phenylindene

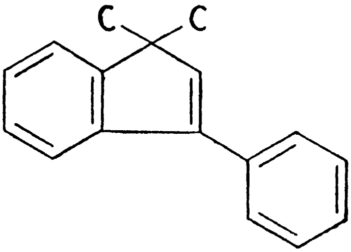


M. P., °C

61–62[12]

51[11]

1,1-Dimethyl-3-phenylindene



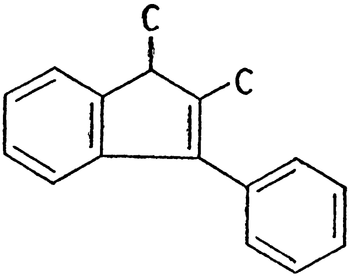
M. P., °C

50–51[2, 13]

B. P., °C @ 760mm

184–185	27[13]

1,2-Dimethyl-3-phenylindene



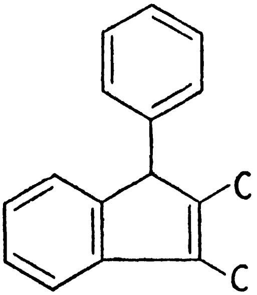
M. P., °C

68–69[16]

B. P., °C @ 760mm

145–153	4[16]

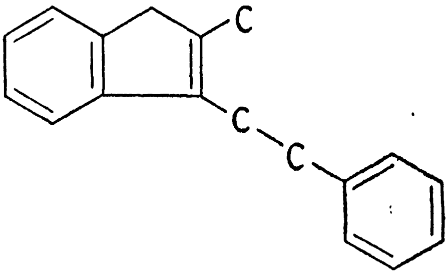
1-Phenyl-2,3-dimethylindene



M. P., °C
68–69[13]

$C_{18}H_{18}$

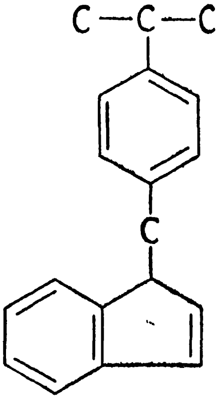
2-Methyl-3-phenethylindene



B. P., °C @ 760mm
170 1[8]

$C_{19}H_{20}$

1-(4′-Isopropylbenzyl)-indene



M. P., °C
32[3]

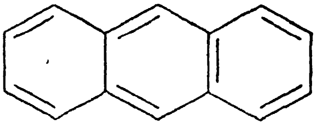
References on Indene with One Phenyl Substitution

1. Allen, C. F. H., C. G. Eliot, and A. Bell, Can. J. Research **17B, 75 1939.**
2. Bergmann, E., H. Taubadel, and H. Weiss, Ber. **64,** 1493 **1931.**
3. Bernthsen, W., Ann. **415,** 274 **1918.**
4. Blum-Bergmann, O., Ann. **484,** 26 **1930.**
5. Blum-Bergmann, O., Ann. **492,** 277 **1932.**
6. Blum-Bergmann, O., Ber. **65,** 109 **1932.**
7. Cook, J. W., and C. L. Hewett, J. Chem. Soc. **1934,** 365.
8. Cook, J. W., C. L. Hewett, W. V. Mayneord, and E. Roe, J. Chem. Soc. **1934,** 1727.
9. Courtot, C., Ann. chim. [9] **5,** 52 **1916.**
10. Courtot, C., Compt. rend. **160,** 523 **1915.**
11. Earl, J. C., and C. A. Smythe, J. Proc. Roy. Soc. N. S. Wales **64,** 90 **1930.**
12. Koelsch, C. F., and P. R. Johnson. J. Am. Chem. Soc. **65,** 565 **1943.**
13. Koelsch, C. F., and P. R. Johnson, J. Am. Chem Soc. **65,** 567 **1943.**
14. Marckwald, W., Ber. **33,** 1501 **1900.**
15. Mayer, F., A. Sieglitz, and W. Ludwig, Ber. **54,** 1397 **1921.**
16. Smith, L. I., and L. I. Hanson, J. Am. Chem. Soc. **57,** 1326 **1935.**
17. Thiele, J., and A. Bühner, Ann. **347,** 249 **1906.**
18. Thiele, J., and K. Merck, Ann. **415,** 257 **1918.**
19. von Braun, J., Ber. **50,** 1658 **1917.**
20. von Braun, J., and G. Manz, Ber. **62,** 1059 **1929.**
21. Weissgerber, R., Ber. **44,** 1436 **1911.**
22. Wislicenus, W., and W. Hentrick, Ann. **436, 9 1924.**
23. Ziegler, K., and P. Tiemann, Ber. **55,** 3406 **1922.**

2. ANTHRACENE AND ITS ALKYL DERIVATIVES, C_nH_{2n-18}

$C_{14}H_{10}$

Anthracene



M. P., °C

216.6

219[147, 148, 149]

218[18, 23, 67, 136]

217.6[146]

217–217.5[95]

217 (a)

216–217[57, 66]

216–216.8[140]

216.4–216.7[14, 15]

216.6[104]

216.55[116]

216.5[28, 97, 112, 113]

216.0–216.5[117]

216–216.5[94]

216.4[103]

216.18[92]

216.1[128]

216.0_5[26]

216 (b)

B. P., °C @ 760mm

341.4

342.0[104]

342[114]

340.36[44]

340[67]

339.9[26, 92, 128]

339.87[44]

339.77[25]

343.25	778.2[106]
342.05	761.2[106]
341.70	757.3[106]
341.57	756.4[106]
340.6	742.2[104]
340.5	742.2[104]
340.58	738.9[106]
337.70	697.6[106]
337.14	692.7[106]
335.52	674.4[106]
329.47	612.2[106]
328.0	584.0[104]
327.9	583.4[104]
327.4	577.4[104]
325.47	555.5[106]
321.29	515.0[106]
320	502.9[36]
318.20	488.1[106]
313.4	437.0[104]
313.2	436.2[104]
312.8	432.9[104]
310.31	415.6[106]
304.35	363.9[106]
300.6	334.2[104]
300	332.0[36]
300.1	331.3[104]
299.9	330.4[104]
298.22	319.1[106]
297.38	317.7[106]
295.37	303.0[106]
292.15	279.0[106]
286.66	247.7[106]
282.1	219.8[104]
282.0	219.6[104]
280	211.0[36]
277.50	203.2[106]
277.66	198.2[106]
271.75	175[106]
270.70	169.3[106]
263.74	142.5[106]
261.76	135.5[106]
260.3	130.2[104]
259.50	129.5[106]
260	129.1[36]
259.8	128.3[104]
259.4	127.3[104]
254.86	113.4[106]
244.6	86.5[104]

244.59	86.5[106]
244.4	85.9[104]
240	76.0[36]
236.64	69.6[106]
232.12	62.1[106]
231.94	60.2[106]
228.0	55.0[104]
227.77	52.7[106]
226.53	52.7[106]
223.2	48.0[104]

D_4^{20}

1.242 (solid)[120]	
1.244 (solid)[105]	
1.250[14]	
1.252[14]	
1.26[126]	
0.9457	254.7°[92]
0.9456	254.3°[92]
0.9516	246.5°[92]
1.250	27°[109]
1.2477_6	25.00°[99]
1.252	25°[68]
1.253	25°[68]
1.252	22°[19]
1.251	17°[14]
1.303	−195°[19]

n_D^{20}

1.59480	90.35°[135]

Additional Data

$$\frac{1}{T_b} = 0.0025640 - 0.0003252 \log_{10} p_{mm}$$

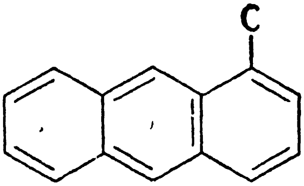
(100 to 780mm)

(a) The melting point 217 is found in references 31, 56, 61, 62, 69, 118, 119, 129, 139.

(b) The melting point 216 is found in references 17, 70, 72, 90, 91, 96, 108, 110, 111, 127.

$C_{15}H_{12}$

1-Methylanthracene



M. P., °C

86[132]
85–86[47, 48, 49, 65, 77]
83–85[89]

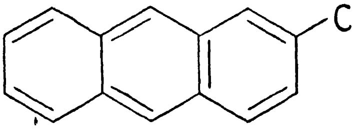
D_4^{20}

1.0471	99.4°[76, 77]

n_D^{20}

1.68027	99.4°[76, 77]
1.66692	$n_{H\alpha}^{99.4}$[76, 77]
1.72106	$n_{H\beta}^{99.4}$[76, 77]

2-Methylanthracene



M. P., °C

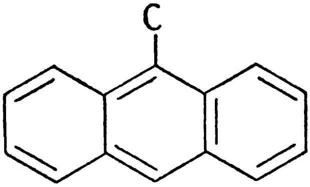
206.5
208–210[137]
209–209.5[94]
207–207.5[72]
207 (a)
206–207[122]
205–207[75]
205[142]
204–205[74]
204.5[82]
204[115]
203–204[47, 55, 71]
202–204[21, 22]
203[20, 70, 98]
202–203[64]
202[29, 34, 115, 133, 134]

B. P., °C @ 760mm

293–297[46]

(a) The melting point 207 is found in references 35, 45, 73, 76, 87, 89, 102, 141.

9-Methylanthracene



M. P., °C

81.5[125]

79–80[76, 78]

78–79[4]

76.3–77.8[43]

D_4^{20}

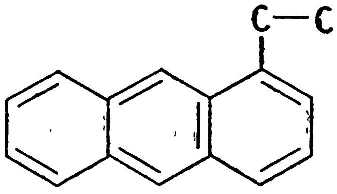
1.0657	99.4°[76]

n_D^{20}

1.69589	99.4°[76]
1.68166	$n_{H\alpha}^{99.4}$[76]
1.74075	$n_{H\beta}^{99.4}$[76]

$C_{16}H_{14}$

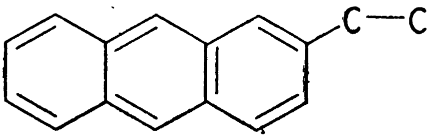
1-Ethylanthracene



M. P., °C

33–34[138]

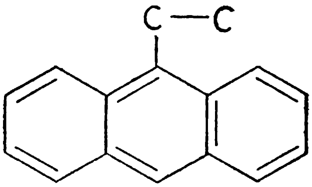
2-Ethylanthracene



M. P., °C

150–151[138]

9-Ethylanthracene



M. P., °C

60–61[84, 85]

59[76, 77, 78, 125]

56–58[43]

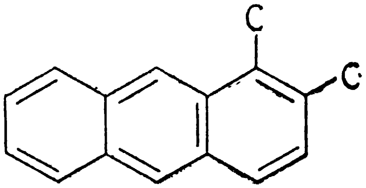
D_4^{20}

1.0413	99.2°[76, 77]

n_D^{20}

1.67621	99.2°[76, 77]
1.66282	$n_{H\alpha}^{99.2}$[76, 77]
1.71845	$n_{H\beta}^{99.2}$[76, 77]

1,2-Dimethylanthracene



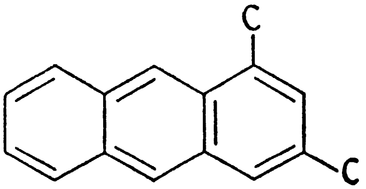
M. P., °C

85.5–86[7]

B. P., °C @ 760mm

180	0.4[7]

1,3-Dimethylanthracene



M. P., °C

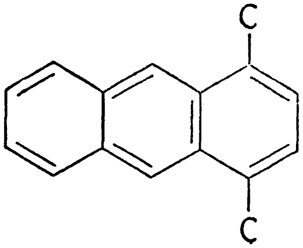
204[38]

202–203[55, 86]

202[71]

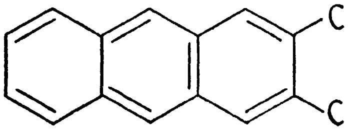
200[130]

1,4-Dimethylanthracene



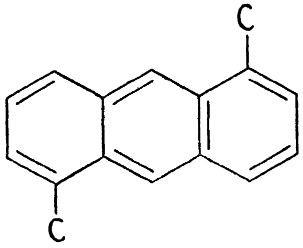
M. P., °C
76[11]
74[132]
71[88]

2,3-Dimethylanthracene



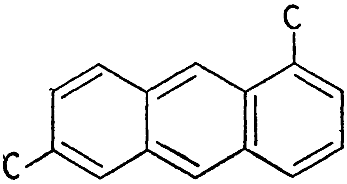
M. P., °C
252[12, 102]
246[38, 40]
244–246[24]

1,5-Dimethylanthracene



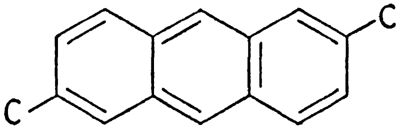
M. P., °C
139–140[58]

1,6-Dimethylanthracene



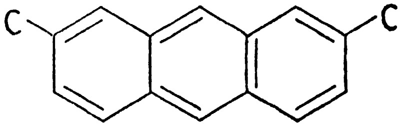
M. P., °C
240[22, 30, 82, 83]

2,6-Dimethylanthracene



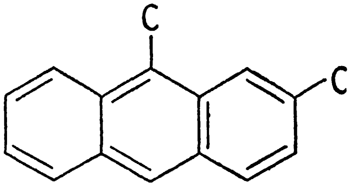
M. P., °C
245
250[100]
248[102]
243[6, 123]
242–243[50]

2,7-Dimethylanthracene



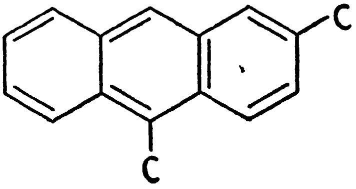
M. P., °C
242
244.5[82, 83]
243–244[2, 81]
241[100]
239[102]
235[73]

2,9-Dimethylanthracene



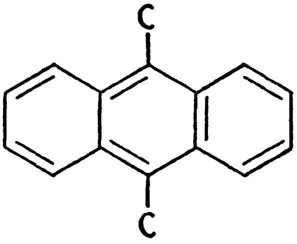
M. P., °C
85[8]

2,10-Dimethylanthracene



M. P., °C
85[8]

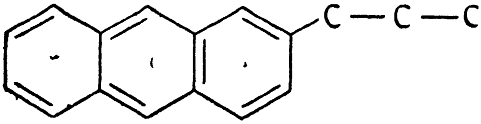
9,10-Dimethylanthracene



M. P., °C
181
182.8–183.8[16]
181–181.5[79]
181[13]
180.5–181[3]
180–181[54]

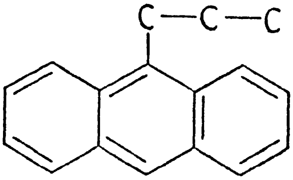
$C_{17}H_{16}$

2-*n*-Propylanthracene



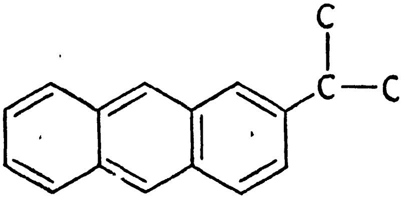
M. P., °C
126[138]

9-*n*-Propylanthracene



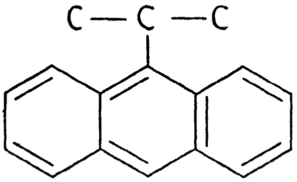
M. P., °C
69–70[125]

2-Isopropylanthracene



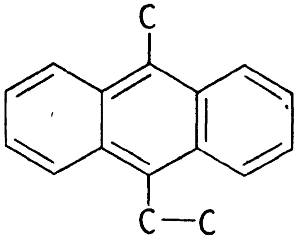
M. P., °C
154–155[138]

9-Isopropylanthracene



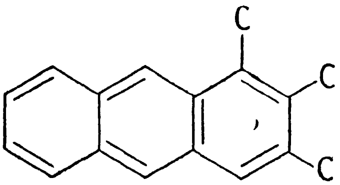
M. P., °C
76[13]

9-Methyl-10-ethylanthracene



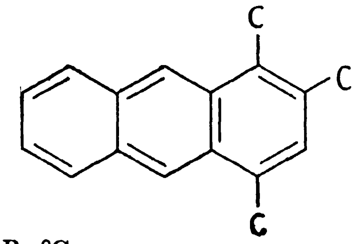
M. P., °C
144[145]
143.2–144[16]
143–144[144]

1,2,3-Trimethylanthracene



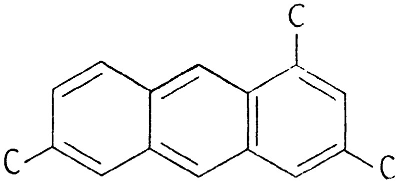
M. P., °C
243[143]
236[143]

1,2,4-Trimethylanthracene



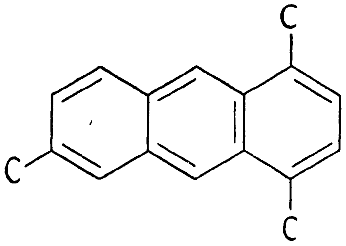
M. P., °C
244[39]
243[55, 102]
236[86]

1,3,6-Trimethylanthracene



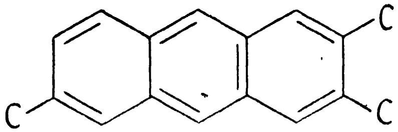
M. P., °C
$222^{39, 102}$

1,4,6-Trimethylanthracene



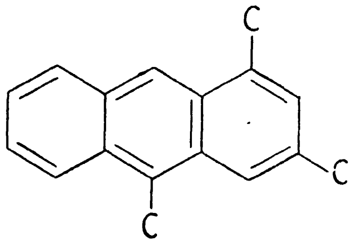
M. P., °C
$227^{37, 39, 41, 102}$

2,3,6-Trimethylanthracene



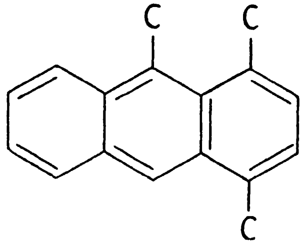
M. P., °C
255^{101}
252^{102}

1,3,10-Trimethylanthracene



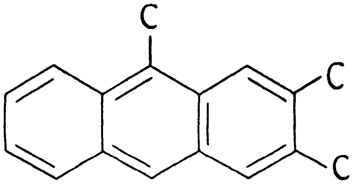
M. P., °C
100^{10}

1,4,9-Trimethylanthracene



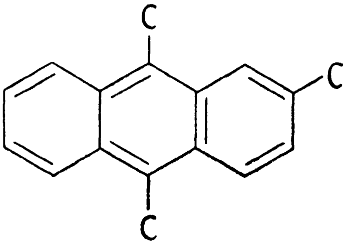
M. P., °C
81^{11}

2,3,9-Trimethylanthracene



M. P., °C
125^{12}

2,9,10-Trimethylanthracene

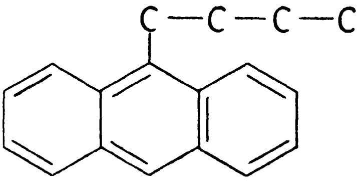


M. P., °C
100–101 (a)^{3}
95–96 (a)^{3}

(a) These constants were determined on different crystalline forms.

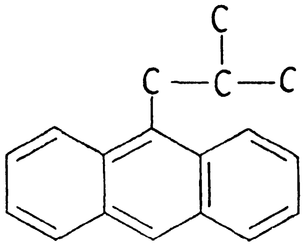
$C_{18}H_{18}$

9-*n*-Butylanthracene



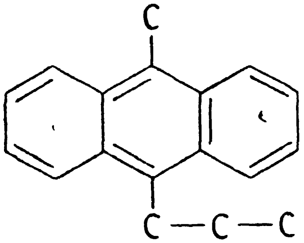
M. P., °C
57^{85}
$49–50^{125}$

9-Isobutylanthracene



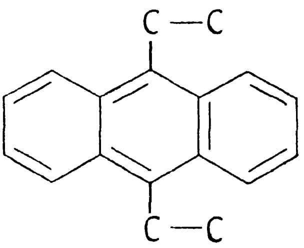
M. P., °C
57^{84}

9-Methyl-10-*n*-propylanthracene



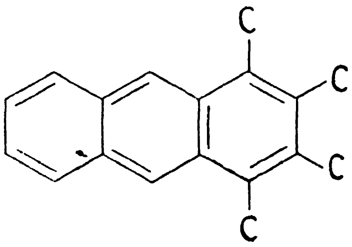
M. P., °C
97.8–98.6^{16}

9,10-Diethylanthracene



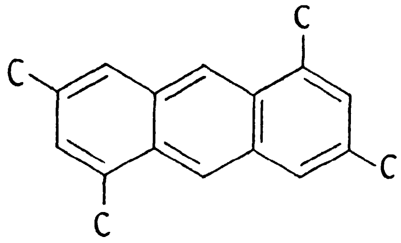
M. P., °C
146–147^{3}
146^{107}
145.5^{60}

1,2,3,4-Tetramethylanthracene



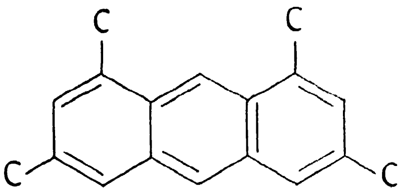
M. P., °C
135.5–136.5^{59}

1,3,5,7-Tetramethylanthracene



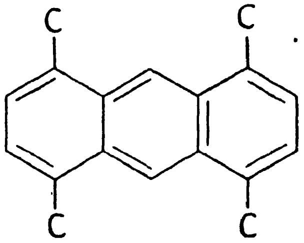
M. P., °C
163–164^{124}
162–163^{52}

1,3,6,8-Tetramethylanthracene



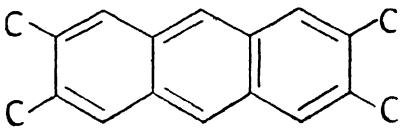
M. P., °C
286–287^{51}
281–283^{124}
280$^{1, 32, 33}$

1,4,5,8-Tetramethylanthracene



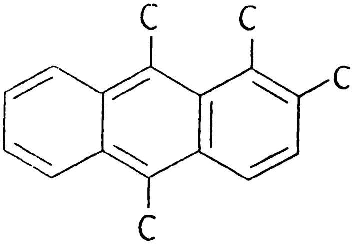
M. P., °C
270^{42}

2,3,6,7-Tetramethylanthracene



M. P., °C
304[42]
301[102]
299[9]

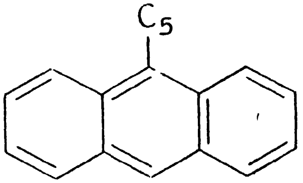
1,2,9,10-Tetramethylanthracene



M. P., °C
52–54[121]

$C_{19}H_{20}$

9-Pentylanthracene (a)



M. P., °C
61[76, 78]
59[84, 85]
58–59[53]
58[131]

D_4^{20}

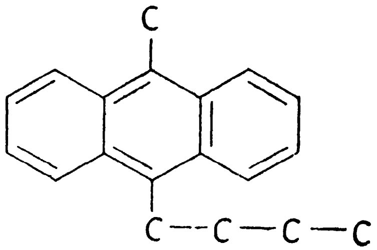
0.9812	99.4° [76]
0.9982	76.5° [131]
0.9987	74.4° [131]
1.0017	71.1° [131]

n_D^{20}

1.62529	99.4° [76]
1.63475	76.5° [131]
1.63636	71.1° [131]
1.61423	$n_{H\alpha}^{99.4}$ [76]
1.62353	$n_{H\alpha}^{76.5}$ [131]
1.62491	$n_{H\alpha}^{71.1}$ [131]
1.66023	$n_{H\beta}^{99.4}$ [76]
1.67008	$n_{H\beta}^{76.5}$ [131]
1.67152	$n_{H\beta}^{71.1}$ [131]

(a) This compound was named *Iso*-amylanthracene in references 53, 76, 78, 131.

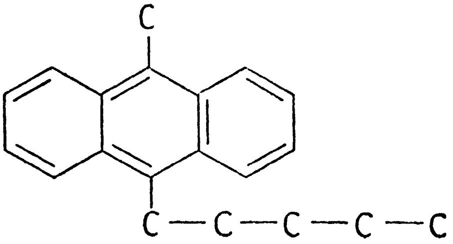
9-Methyl-10-*n*-butylanthracene



M. P., °C
78.2–78.8[16]

$C_{20}H_{22}$

9-Methyl-10-*n*-pentylanthracene



M. P., °C
71–71.8[16]

Diisopropylanthracene (a)

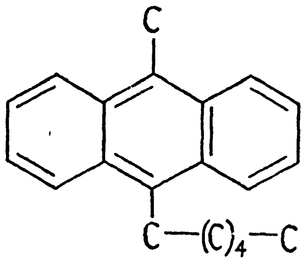
B. P., °C @ 760mm

202–206	0.2[27]

(a) The structure of this compound was not clearly defined in the literature.

$C_{21}H_{24}$

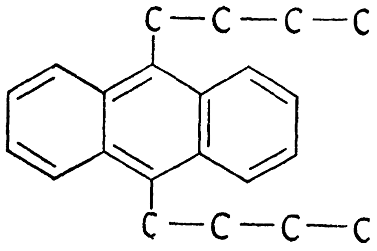
9-Methyl-10-*n*-hexylanthracene



M. P., °C
65.8–66.5[16]

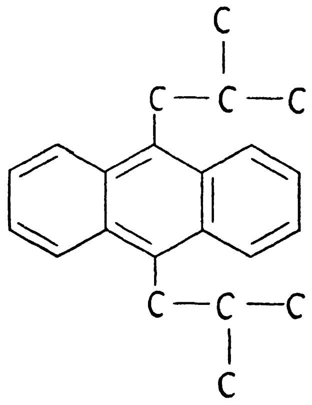
$C_{22}H_{26}$

9,10-Di-*n*-butylanthracene



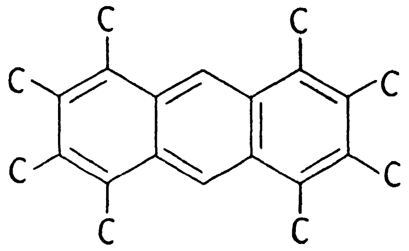
M. P., °C
105–106[60]

9,10-Diisobutylanthracene



M. P., °C
137–138[80, 93]
132–133[60, 93]

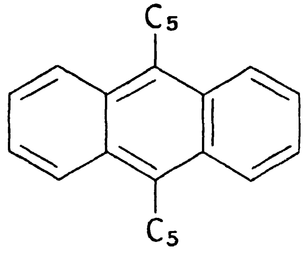
1,2,3,4,5,6,7,8-Octamethylanthracene



M. P., °C
299–300[5]

$C_{24}H_{30}$

9,10-Dipentylanthracene



M. P., °C
132–137[63]
134.5–135 (a)[60]

(a) This compound was named Di*iso*-amylanthracene.

$C_{26}H_{34}$

x,x-Di-(ethylbutyl)-anthracene (a)

B. P., °C @ 760mm
240–256 3[27]

(a) The structure of this compound was not clearly defined in the literature.

$C_{54}H_{90}$

x_5-Penta-(diethylbutyl)-anthracene (a)

M. P., °C
89.2–101[27]

(a) The structure of this compound was not clearly defined in the literature.

References on Anthracene and Its Alkyl Derivatives

1. Anschütz, R., Ann. **235,** 150 **1886.**
2. Anschütz, R., Ann. **235,** 299 **1886.**
3. Bachmann, W. E., and J. M. Chemerda, J. Org. Chem. **4,** 583 **1939.**
4. Bachmann, W. E., and M. C. Kloetzel, J. Org. Chem. **3,** 55 **1938-1939.**
5. Backer, H. J., J. Strating, and L. H. H. Huisman, Rec. trav. chim. **58,** 761 **1939.**
6. Baddeley, G., and J. Kenner, Ber. **69,** 902 **1936.**
7. Badger, G. M., J. W. Cook, and F. Goulden, J. Chem. Soc. **1940,** 16.
8 Barnett, E. de B., and N. F. Goodway, J. Chem. Soc. **1929,** 1754.
9. Barnett, E. de B., N. F. Goodway, and J. W. Watson, Ber. **66,** 1876 **1933.**
10. Barnett, E. de B., and C. L. Hewett, Ber. **64,** 1572 **1931.**
11. Barnett, E. de B., and J. A. Low, Ber. **64,** 49 **1931.**
12. Barnett, E. de B., and F. C. Marrison, Ber. **64,** 535 **1931.**
13. Barnett, E. de B., and M. A. Mathews, Ber. **59,** 1429 **1926.**
14. Baxter, G. P., and A. H. Hale, J. Am. Chem. Soc. **58,** 510 **1936.**
15. Baxter, G. P., and A. H. Hale, J. Am. Chem. Soc. **59,** 506 **1937.**
16. Berliner, E., J. Am. Chem. Soc. **66,** 533 **1944.**
17. Berton, A., Compt. rend. **208,** 1898 **1939.**
18. Bhatnagar, S. S., M. R. Verma, and P. L. Kapur, Indian J. Phys. **9,** 131 **1934.**
19. Biltz, W., W. Fischer, and E. Wünnenberg, Z. physik. Chem. **151A,** 13 **1930.**
20. Bornstein, E., Ber. **15,** 1820 **1882.**
21. Bornstein, E., Ber. **39,** 1238 **1906.**
22. Bornstein, E., H. Schliewiensky, and G. V. Szszesny-Heyl, Ber. **59,** 2812 **1926.**
23. Bradley, G., and J. K. Marsh, J. Chem. Soc. **1933,** 650.
24. Bradley, M. J., and S. W. Parr, Chem. & Met. Eng. **27,** 737 **1922.**
25. Burgstaller, S., Abhandl. Deutschen nat. Ver. für Böhmen "Lotos" in Prag. **3,** 83 **1912;** Chem. Zentr. **1912,** II, 1525.
26. Burriel, F., Anales soc. españ. fís. quím. **29,** 89 **1931;** C. A. **25,** 2885 **1931;** Chem. Zentr. **1931,** I, 2732.
27. Calcott, W. S., J. M. Tinker, and V. Weinmayr, J. Am. Chem. Soc. **61,** 1010 **1939.**
28. Capper, N. S., and J. K. Marsh, J. Am. Chem. Soc. **47,** 2847 **1925.**
29. Clar, E., F. John, and B. Hawran, Ber. **62,** 940 **1929.**
30. Cook, J. W., and V. J. Chambers, J. Am. Chem. Soc. **43,** 334 **1921.**
31. Dermer, O. C., and J. King, J. Am. Chem. Soc. **63,** 3232 **1941.**
32. Dewar, J., and H. O. Jones, J. Chem. Soc. **85,** 212 **1904.**
33. Dewar, J., and H. O. Jones, Proc. Chem. Soc. **20,** 6 **1904.**
34. Dieterle, H., and A. Salomon, Arch. Pharm. **271,** 177 **1933.**
35. Dieterle, H., A. Salomon, and E. Nosseck, Ber. **64,** 2086 **1931.**
36. Dodge, B. F., J. Ind. Eng. Chem. **14,** 569 **1922.**
37. Elbs, K., J. prakt. Chem. [2] **35,** 465 **1887.**
38. Elbs, K., J. prakt. Chem. [2] **41,** 1 **1890.**
39. Elbs, K., J. prakt. Chem. [2] **41,** 121 **1890.**
40. Elbs, K., and H. Eurich, Ber. **20,** 1361 **1887.**
41. Elbs, K., and G. Olberg, Ber. **19,** 408 **1886.**
42. Ellison, H., and D. H. Hey, J. Chem. Soc. **1938,** 1847.
43. Fieser, L. F., and J. L. Hartwell, J. Am. Chem. Soc. **60,** 2555 **1938.**
44. Finck, J. L., and R. M. Wilhelm, J. Am. Chem. Soc. **47,** 1577 **1925.**
45 Fischer, O., J. prakt. Chem. [2] **79,** 555 **1909.**
46. Fischer, O., and L. Costner, J. prakt. Chem. [2] **82,** 280 **1910.**
47. Fischer, O., F. Falco, and H. Gross, J. prakt. Chem. [2] **83,** 208 **1911.**
48. Fischer, O., and A. Sapper, J. prakt. Chem. [2] **83,** 201 **1911.**
49. Fischer, O., and H. Ziegler, J. prakt. Chem. [2] **86,** 289 **1912.**

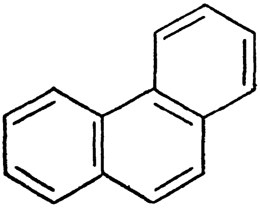
50. Flumiani, G., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **133,** Abt. IIb, 43 **1924.**
51. Frankforter, G. B., and V. R. Kokatnur, J. Am. Chem. Soc. **36,** 1529 **1914.**
52. Friedel, C., and J. M. Crafts, Ann. chim. phys. [6] **11,** 263 **1887.**
53. Gerry, H. T., through R. L. Wakeman, Thesis, Mass. Inst. Tech. **1930.**
54. Gibson, C. S., and J. D. A. Johnson, J. Chem. Soc. **1931,** 753.
55. Gresly, L., Ann. **234,** 234 **1886.**
56. Grigor'ev, S. M., Coke and Chem. (U.S.S.R.) **7,** No. 6, 16 **1937;** Chem. Zentr. **1938,** II, 463.
57. Grimm, H. G., M. Günther, and H. Tittus, Z. physik. Chem. **14B,** 169 **1931.**
58. Haworth, R. D., and G. Sheldrick, J. Chem. Soc. **1934,** 1950.
59. Hewett, C. L., J. Chem. Soc. **1940,** 293.
60. Hugel, G., and M. Lerer, Bull. soc. chim. [4] **53,** 1497 **1933.**
61. Il'inskiĭ, M. A., and B. I. Afremov, Ber. **69,** 1824 **1936.**
62. Il'inskiĭ, M., and V. Afremov, Compt. rend. acad. sci. U.R.S.S. **3,** 135 **1936.**
63. Jungermann, E., Ber. **38,** 2868 **1905.**
64. Kafuku, K., and K. Sebe, Bull. Chem. Soc. Japan **7,** 114 **1932.**
65. Keimatsu, S., I. Hirano, and K. Yoshimi, J. Pharm. Soc. Japan **50,** 95 **1930;** C.A. **24,** 5037 **1930;** Chem. Zentr. **1930,** II, 2384.
66. Kempf, R., J. prakt. Chem. [2] **78,** 201 **1908.**
67. Kirby, W., J. Soc. Chem. Ind. **40,** 274T **1921.**
68. Klemm, W., W. Tilk, and S. von Mullenheim, Z. anorg. allgem. Chem. **176,** 1 **1928.**
69. Klepper, J., Compt. rend. Congr. chim. ind. **8,** 261 **1929.**
70. Kögl, F., and H. Erxleben, Ann. **479,** 11 **1930.**
71. Kögl, F., and I. Y. Postovskiĭ, Ann. **440,** 19 **1924.**
72. Koller, G., and H. Russ, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **146,** Abt. IIb, 54 **1937.**
73. Kraemer, G., A. Spilker, and P. Eberhardt, Ber. **23,** 3269 **1890.**
74. Krasovskiĭ, N., J. Russ. Phys. Chem. Soc. **40,** 1510 **1908;** C.A. **4,** 2263 **1910;** Chem. Zentr. **1909,** I, 772.
75. Krasovskiĭ, N., J. Russ. Phys. Chem. Soc. **46,** 1067 **1914;** Chem. Zentr. **1915,** I, 999.
76. Krollpfeiffer, F., Ann. **430,** 161 **1923.**
77. Krollpfeiffer, F., Ber. **56,** 77 **1923.**
78. Krollpfeiffer, F., and F. Branscheid, Ber. **56,** 1617 **1923.**
79. Kursanov, D. N., and R. R. Zel'vin, Compt. rend. acad. sci. U.R.S.S. **36,** 17 **1942;** Survey For. Petrol. Liter. Sept. 10, **1943.**
80. Larsen, R. G., R. E. Thorpe, and F. A. Armfield, Ind. Eng. Chem. **34,** 183 **1942.**
81. Lavaux, J., Compt. rend. **141,** 354 **1905.**
82. Lavaux, P., Ann. chim. phys. [8] **20,** 436 **1910.**
83. Lavaux, P., Ann. chim. phys. [8] **21,** 131 **1910.**
84. Liebermann, C., Ann. **212,** 1 **1882.**
85. Liebermann, C., and G. Tobias, Ber. **14,** 795 **1881.**
86. Liebermann, C., and S. von Kostanecki, Ann. **240,** 245 **1887.**
87. Limpricht, H., and O. Weigand, Ann. **311,** 178 **1900.**
88. Louise, E., Bull. soc. chim. [2] **44,** 177 **1885.**
89. Majima, R., and C. Kuroda, Acta Phytochim. (Japan) **1,** 43 **1922.**
90. Mameli, E., and A. Mossini, Giorn. chim. ind. applicata **15,** 161 **1933.**
91. Manzoni-Ansidei, R., Gazz. chim. ital. **67,** 790 **1937.**
92. Marti, F. B., Bull. soc. chim. Belg. **39,** 590 **1930.**
93. Martin, E., Ann. combustibles liquides **12,** 97 **1937.**
94. Martin, E. L., J. Am. Chem. Soc. **58,** 1438 **1936.**
95. Marx, W., and H. Sobotka, J. Org. Chem. **1,** 275 **1936.**
96. McVicker, W. H., J. K. Marsh, and A. W. Stewart, J. Chem. Soc. **127,** 999 **1925.**
97. Miller, H. F., and J. Bachman, J. Am. Chem. Soc. **57,** 766 **1935.**
98. Mitter, P. C., and A. K. Sen, J. Indian Chem. Soc. **5,** 631 **1928.**

99. Miyaka, S., Mem. Coll. Eng. Kyushu Imp. Univ. **6,** 1 **1931–1932.**
100. Morgan, G. T., and E. A. Coulson, J. Chem. Soc. **1929,** 2203.
101. Morgan, G. T., and E. A. Coulson, J. Chem. Soc. **1929,** 2551.
102. Morgan, G. T., and E. A. Coulson, J. Soc. Chem. Ind. **53,** 71T **1934.**
103. Mortimer, F. S., J. Am. Chem. Soc. **44,** 1416 **1922.**
104. Mortimer, F. S., and R. V. Murphy, Ind. Eng. Chem. **15,** 1140 **1923.**
105. Mukherjee, A., Indian J. Phys. **8,** 147 **1933.**
106. Nelson, O., and C. Senseman, Ind. Eng. Chem. **14,** 58 **1922.**
107. Nenitzescu, C. D., and D. A. Isăcescu, Ber. **66,** 1100 **1933.**
108. Obreĭmov, I., and A. Prikhot'ko, Physik. Z. Sowjetunion **1,** 203 **1932.**
109. Orndorff, W. R., and F. K. Cameron, Am. Chem. J. **17,** 658 **1895.**
110. Padoa, M., Atti accad. Lincei [5] **27,** II, 59 **1918.**
111. Padoa, M., Gazz. chim. ital. **48,** II, 139 **1918.**
112. Parks, G. S., and H. M. Huffman, Ind. Eng. Chem. **23,** 1138 **1931.**
113. Pascal, P., Bull. soc. chim. [4] **29,** 644 **1921.**
114. Pieters, H. A. J., and H. van den Burge, Brennstoff-Chem. **20,** 201 **1939.**
115. Raistrick, H., R. Robinson, and A. R. Todd, J. Chem. Soc. **1937,** 80.
116. Reissert, A., Ber. **23,** 2239 **1890.**
117. Rheinboldt, H., J. prakt. Chem. [2] **111,** 242 **1925.**
118. Robertson, J. M., Proc. Roy. Soc. **140A,** 79 **1933.**
119. Robertson, J. M., Z. Krist. **84,** 321 **1933.**
120. Rudolfi, E., Z. physik. Chem. **66,** 705 **1909.**
121. Sandin, R. B., R. Kitchen, and L. F. Fieser, J. Am. Chem. Soc. **65,** 2018 **1943.**
122. Scholl, R., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **127,** Abt. IIb, 33 **1918.**
123. Seer, C., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **120,** Abt. IIb, 3 **1911.**
124. Seer, C., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **120,** Abt. IIb, 957 **1911.**
125. Sieglitz, A., and R Marx, Ber. **56,** 1619 **1923.**
126. Skraup, S., and M. Eisemann, Ann. **449,** 1 **1926.**
127. Tamman, G., Z. anorg. allgem. Chem. **157,** 321 **1926.**
128. Timmermans, J., and F. Burriel, Compt. rend. Congr. chim. ind. **10,** 196 **1931.**
129. Trusty, A. W., Petroleum Refiner **22,** 95 **1943.**
130. van Dorp, A., Ber. **5,** 674 **1872.**
131. von Auwers, K., Ber. **53,** 941 **1920.**
132. von Braun, J., and O. Bayer, Ber. **59,** 914 **1926.**
133. von Braun, J., O. Bayer, and L. F. Fieser, Ann. **459,** 287 **1927.**
134. von Niementowski, S., Ber. **33,** 1629 **1900.**
135. von Steiger, A. L., Ber. **56,** 998 **1923.**
136. von Weimarn, N., Kolloid Z. **54,** 296 **1931.**
137. Wachendorff, C., and T. Zincke, Ber. **10,** 1481 **1877.**
138. Waldmann, H., and E. Marmorstein, Ber. **70,** 106 **1937.**
139. Waser, E., Helv. Chim. Acta **8,** 758 **1925.**
140. Waterman, H. I., J. J. Leendertse, and A. C. Cranendonk, Rec. trav. chim. **58,** 83 **1939.**
141. Weger, M., Z. angew. Chem. **22,** 338 **1909.**
142. Weigert, F., and O. Krüger, Z. physik. Chem. **85,** 579 **1913.**
143. Wende, H., Ber. **20,** 867 **1887.**
144. Willemart, A., Bull. soc. chim. [5] **5,** 556 **1938.**
145. Willemart, A., Compt. rend. **205,** 866 **1937.**
146. Williams, J. W., and E. F. Ogg, J. Am. Chem. Soc. **50,** 94 **1928.**
147. Winterstein, A., and K. Schön, Naturwissenschaften **22,** No. 15, 237 **1934.**
148. Winterstein, A., and K. Schön, Z. physiol. Chem. **230,** 146 **1934.**
149. Winterstein, A., K. Schön, and H. Vetter, Z. physiol. Chem. **230,** 158 **1934.**

3. PHENANTHRENE AND ITS ALKYL DERIVATIVES, C_nH_{2n-18}

$C_{14}H_{10}$

Phenanthrene



M. P., °C

100 .3
103.5[59]
103.05[105]
103.0[59]
103[60, 75]
102.5–103[51]
101–102[118]
101[17, 18, 48, 53]
100.7–101[32]
100–101[107]
100.0–100.9[24]
100.5[113]
100.4[119]
100.35[126]
100.3[122]
100(a)
99.6–100[66]
99 5–100[137]
99–100(b)
99.8[22]
99.6[132]
99.5[67, 101]
99–99.5[23, 79]
98.8–99.5[89]
98.7–99.5[1]
98.5–99.5[5]
99.0[30]
99 (c)
98–99[55, 83, 114, 115, 124, 125]
98.8[100]
98.2–98.8[103]
98.5[57, 94, 97]
98.0[82]
98[15, 29, 88, 133]
97.5–98[35, 52]
97–98[2, 19, 20, 27, 33, 72]
97.8[80]
97.7[49]
97–97.5[131]
96.5–97.5[38]
97.3[13]
97.2[10]
96–97[20, 34, 92]
96.3[99]
96.25[37, 89]
96.2[74]
96.1[121]
96[45, 56, 68, 93, 130]
95–96[129]
95.85[78]
95.57[12]

B. P., °C @ 760mm

339 .6
340 (d)
338.5[82]
337.8[81]

346.8	883.9[82]
345.7	870.9[82]
345.1	864.4[82]
340.59	764.2[86]
340.41	762.3[86]
339.91	754.3[86]
337.1	741.0[82]
333.08	664.6[86]
332.11	654.4[86]
330	629.4[28]
325.4	592.6[82]
324.9	588.7[82]
324.5	584.7[82]
321.24	531.5[86]
320	518.8[28]
319.27	510.7[86]
312.62	446.0[86]
309.44	420.3[86]
308.64	414.8[86]
306.5	399.7[82]

306.4	399.2[82]
300.91	350.9[86]
300	343.7[28]
299.88	340.2[86]
295.37	311.4[86]
294.57	307.4[86]
293.2	299.9[82]
293.2	299.8[82]
293.1	299.7[82]
282.73	234.1[86]
281.33	226.1[86]
280	220.0[28]
271.5	183.0[82]
271.5	182.9[82]
269.89	172.4[86]
264.73	151.4[86]
260	135.5[28]
249.14	101.5[86]
246.1	94.6[82]
246.59	94.5[86]
246.0	94.3[82]
240	79.0[28]
233.8	67.5[82]
233.54	65.4[86]
232.34	62.2[86]
203.6	27.2[82]

D_4^{20}

1.172 (solid)[61]	
1.174 (solid)[84]	
1.175 (solid)[47]	
1.182 (solid)[106]	
1.018	170°[110]
1.031	150°[110]
1.030	149.8°[111]
1.0412	131.1°[63]
1.046	130°[110]
1.046	129.8°[111]
1.058	110°[110]
1.0630	100.5°[113]
1.058	99.8°[111]
1.0395	97.03°[12]
1.0418	93.53°[12]
1.0459	89.43°[12]
1.0483	85.93°[12]
1.0514	81.82°[12]
1.0540	78.32°[12]
1.0590	71.62°[12]
1.0620	67.53°[12]
1.0671	60.83°[12]
1.0688	57.33°[12]
1.1648 (solid)	47.12°[12]
1.1752 (solid)	28.91°[12]
1.179	25°[62]
1.1816 (solid)	19.46°[12]

n_D^{20}

1.629	170°[110]
1.639_5	150°[110]
1.6395	149.8°[111]
1.650	130°[110]
1.6502	129.8°[111]
1.65671	129.6°[63]
1.660	110°[110]
1.6600	99.8°[111]
1.64646 (e)	$n_{H\alpha}^{130.6}$[63]

Additional Data

$$\frac{1}{T_b} = 0.0025694 - 0.0003254 \log_{10} p_{mm}$$

(100 to 885mm)

(a) The melting point 100 is found in references 3, 4, 11, 14, 16, 18, 21, 40, 41, 43, 44, 46, 64, 70, 77, 86, 87, 90, 95, 96, 98, 102, 108, 109, 112, 114, 115, 120, 128.

(b) The melting point 99–100 is found in references 7, 25, 36, 50, 71, 116, 134, 136.

(c) The melting point 99 is found in references 8, 9, 26, 31, 37, 42, 58, 69, 73, 76, 91, 104, 117, 119, 134, 135, 136.

(d) The boiling point 340 is found in references 6, 16, 38, 54, 65, 69, 117, 123, 127, 129, 130.

(e) Refractive indices at other lines are found in reference 85.

References on Phenanthrene

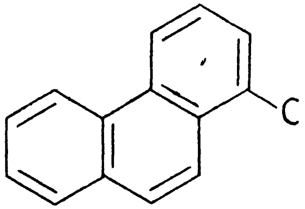
1. Bachmann, W. E., J. Am. Chem. Soc. **57,** 555 **1935.**
2. Bachmann, W. E., and M. C. Kloetzel, J. Am. Chem. Soc. **60,** 2204 **1938.**
3. Bardhan, J. C., Chemistry & Industry **55,** 879 **1936.**
4. Bardhan, J. C., and S. C. Sengupta, J. Chem. Soc. **1932,** 2520.
5. Behrend, R., Z. physik. Chem. **10,** 265 **1892.**
6. Beilstein through E. Krober, Z. physik. Chem. **93,** 641 **1919.**
7. Bergell, P., and R. Pschorr, Z. physiol. Chem. **38,** 16 **1903.**
8. Berger, H., J. prakt. Chem. [2] **133,** 331 **1932.**
9. Bergmann, E., J. Am. Chem. Soc. **60,** 1798 **1938.**
10. Bernoulli, A. L., and P. Lotter, Helv. Chim. Acta **16,** 246 **1933.**
11. Bhatnagar, S. S., M. R. Verma, and P. L. Kapur, Indian J. Phys. **9,** 131 **1934–1935.**
12. Block, H., Z physik. Chem. **78,** 385 **1912.**
13. Bradley, G., and J. K. Marsh, J. Chem. Soc. **1933,** 650.
14. Büchner, E. H., Z. physik. Chem. **54,** 665 **1906.**
15. Capper, N. S., and J. K. Marsh, J. Chem. Soc. **129,** 724 **1926.**
16. Carnelley, T., J. Chem. Soc. **32,** 653 **1877.**
17. Carnelley, T., J. Chem. Soc. **37,** 701 **1880.**
18. Centnerszwer, M., Z. physik. Chem. **46,** 427 **1903.**
19. Charrier, G., and A. Beretta, Gazz. chim. ital. **54,** 765 **1924.**
20. Charrier, G., and E. Ghigi, Ber. **69,** 2211 **1936.**
21. Chatterjee, N. N., J. Indian Chem. Soc. **13,** 659 **1936.**
22. Clark, J. M., J. Ind. Eng. Chem. **11,** 205 **1919.**
23. Cohen, F. L., and U. Cormier, J. Am. Chem. Soc. **52,** 4363 **1930.**
24. Davis, W. W., M. E. Krahl, and G. H. A. Clowes, J. Am. Chem. Soc. **62,** 3080 **1940.**
25. Denisenko, Y. I., and V. M. Kotel'nikova, J. Gen. Chem. (U.S.S.R.) **7,** 2819 **1937;** Chem. Zentr. **1938, II,** 3081.
26. Dewar, J., and J. Read, J. Soc. Chem. Ind. **55,** 347T **1936.**
27. Dieterle, H., and H. Rochelmeyer, Arch. Pharm. **273,** 532 **1935.**
28. Dodge, B. F., J. Ind. Eng. Chem. **14,** 569 **1922.**
29. Durland, J. R., and H. Adkins, J. Am. Chem. Soc. **60,** 1501 **1938.**
30. Efremov, N. N., and A. N. Tikhomirova, Ann. inst. anal. phys. chim. (U.S.S.R.) **4,** 92 **1928;** C.A. **23,** 3214 **1929;** Chem. Zentr. **1929, I,** 745.
31. Efremov, N. N., and A. Tikhomirova, J. Russ. Phys. Chem. Soc. **59,** 373 **1927;** C.A. **22,** 2508 **1928.**
32. Fieser, L. F., M. Fieser, and E. B. Hershberg, J. Am. Chem. Soc. **58,** 1463 **1936.**
33. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **57,** 1508 **1935.**
34. Fieser, L. F., and H. L. Holmes, J. Am. Chem. Soc. **58,** 2319 **1936.**
35. Fieser, L. F., R. P. Jacobsen, and C. C. Price, J. Am. Chem. Soc. **58,** 2163 **1936.**
36. Fittig, R., and E. Ostermeyer, Ann. **166,** 361 **1873.**
37. Flumiani, G., Z. Elektrochem. **32,** 221 **1926.**
38. Fries, K., R. Walter, and K. Schilling, Ann. **516,** 248 **1935.**
39. Garelli, F., and A. Ferratini, Atti accad. Lincei [5] **2,** I, 275 **1893.**
40. Gavăt, I., and I. Irimescu, Ber. **75,** 820 **1942.**
41. Goldschmiedt, G., and M. von Schmidt, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **83,** Abt. IIb, 7 **1881.**
42. Graebe, C., Ber. **37,** 4145 **1904.**
43. Grewe, R., Ber. **72,** 785 **1939.**
44. Grinbaum, R., and L. Marchlewski Bull. intern. acad. polon. sci., Classe sci. math. nat. **1937A,** 171; Chem. Zentr. **1938,** I, 1102.
45. Hayduck, M., Ann. **167,** 177 **1873.**
46. Heller, G., Ber. **45,** 665 **1912.**
47. Hengstenberg, J., and H. Mark, Z. Krist. **70,** 283 **1929.**

48. Henstock, H., J. Chem. Soc. **121,** 2124 **1922.**
49. Huffman, H. M., G. S. Parks, and M. Barmore, J. Am. Chem. Soc. **53,** 3876 **1931.**
50. Il'inskiĭ, M. A., and R. B. Rozal, Compt. rend. acad. sci. (U.R.S.S.) [N.S.] **17,** 120 **1937.**
51. Juch, V., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **114,** Abt. IIb, 411 **1905.**
52. Khadzhinov, V. N., Coke and Chem. (U.S.S.R.) **7,** No. 8, 45 **1937;** Chem. Zentr. **1938,** I, 492.
53. Kirby, W., J. Soc. Chem. Ind. **40,** 274T **1921.**
54. Knovenagel, E., and A. Tomasczewski, Ber. **36,** 2829 **1903.**
55. Kögl, F., H. Erxleben, and L. Janecke, Ann. **482,** 105 **1930.**
56. Kopp, A., Mon. sci. [3] **8,** 1147 **1878.**
57. Krafft, F., and H. Weiland, Ber. **29,** 2240 **1896.**
58. Kramers, J. G., Ann. **189,** 129 **1877.**
59. Kremann, R., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **117,** Abt. IIb, 569 **1908.**
60. Kremann, R., and F. Hofmeier, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **119,** Abt. IIb, 121 **1910.**
61. Krishnan, K. S., and S. Banerjee, Trans. Roy. Soc. (London) **234,** 265 **1935.**
62. Kröber, E., Z. physik. Chem. **93,** 641 **1919.**
63. Krollpfeiffer, F., Ann. **430,** 161 **1923.**
64. Krollpfeiffer, F., Ber. **56,** 77 **1923.**
65. Lagerlöf, D., J. prakt. Chem. [2] **98,** 136 **1918.**
66. Larsen, R. G., R. E. Thorpe, and F. A. Armfield, Ind. Eng. Chem. **34,** 183 **1942.**
67. Lettré, H., H. Barnbeck, and W. Lege, Ber. **69,** 1151 **1936.**
68. Limpricht, H., Ber. **6,** 532 **1873.**
69. Lippmann, A., Z. Elektrochem. **17,** 15 **1911.**
70. Mameli, E., and A. Mossini, Giorn. chim. ind. applicata **15,** 161 **1933.**
71. Manzoni-Ansidei, R., Gazz. chim. ital. **67,** 790 **1937.**
72. Marvel, C. S., R. Mozingo, and E. C. Kirkpatrick, J. Am. Chem. Soc. **61,** 2003 **1939.**
73. Marx, W., and H. Sobotka, J. Org. Chem. **1,** 275 **1936.**
74. McVicker, W. H., J. K. Marsh, and A. W. Stewart, J. Chem. Soc. **127,** 999 **1925.**
75. Meyer, H., and A. Hoffmann, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **125–126,** Abt. IIb, 449 **1916–1917.**
76. Meyer, R., and K. Taeger, Ber. **53,** 1261 **1920.**
77. Meyer, R., and A. Tanzen, Ber. **46,** 3183 **1913.**
78. Miolati, A., Z. physik. Chem. **9,** 649 **1892.**
79. Morgenstern, O., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **120,** Abt. IIb, 523 **1911.**
80. Mortimer, F. S., J. Am. Chem. Soc. **44,** 1416 **1922.**
81. Mortimer, F. S., J. Am. Chem. Soc. **44,** 1429 **1922.**
82. Mortimer, F. S., and R. V. Murphy, Ind. Eng. Chem. **15,** 1140 **1923.**
83. Mosettig, E., and J. van de Kamp, J. Am. Chem. Soc. **52,** 3704 **1930.**
84. Mukherjee, A., Indian J. Phys. **8,** 147 **1933.**
85. Narasimham, K. L., Indian J. Phys. **6,** 233 **1931.**
86. Nelson, O., and C. Senseman, Ind. Eng. Chem. **14,** 58 **1922.**
87. Nenhaus, A., Ber. **67,** 1627 **1934.**
88. Nenitzescu, C. D., E. Ciorănescu, and M. Maican, Ber. **74,** 687 **1941.**
89. Newman, M. S., and M. D. Farbman, J. Am. Chem. Soc. **66,** 1550 **1944.**
90. Obreĭmov, I., and A. Prikhot'ko, Physik. Z. Sowjetunion **1,** 203 **1932.**
91. Ochiachi, E., J. Pharm. Soc. Japan **1924,** No. 503, 3; Chem. Zentr. **1927,** I, 2321.
92. Orlov, N. A., and N. O. Likhachev, Ber. **62,** 719 **1929.**
93. Ostermayer, E., Ber. **7,** 1089 **1874.**
94. Padoa, M., Atti accad. Lincei [5] **13,** I, 329 **1904.**
95. Padoa, M., Atti accad. Lincei [5] **27,** II, 59 **1918.**

96. Padoa, M., Atti accad. Lincei [5] **28,** II, 239 **1919.**
97. Padoa, M., Gazz. chim. ital. **24,** II, 232 **1904.**
98. Padoa, M., Gazz. chim. ital. **48,** II, 139 **1918.**
99. Parks, G. S., and H. M. Huffman, Ind. Eng. Chem. **23,** 1138 **1931.**
100. Pascal, P., Bull. soc. chim. [4] **29,** 644 **1921.**
101. Perlman, D., D. Davidson, and M. T. Bogert, J. Org. Chem. **1,** 288 **1936.**
102. Pestemer, M., and J. Cecelsky, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **140,** Abt. IIb, 541 **1931.**
103. Price, C. C., J. Am. Chem. Soc. **58,** 1834 **1936.**
104. Pschorr, R., Ber. **29,** 496 **1896.**
105. Reissert, A., Ber. **23,** 2239 **1890.**
106. Rudolfi, E., Z. physik. Chem. **66,** 705 **1909.**
107. Ruggli, P., and A. Staub, Helv. Chim. Acta **19,** 1288 **1936.**
108. Ruggli, P., and A. Staub, Helv. Chim. Acta **20,** 37 **1937.**
109. Ruzicka, L., and H. Hösli, Helv. Chim. Acta **17,** 470 **1934.**
110. Salceanu, C., Compt. rend. **193,** 161 **1931.**
111. Salceanu, C., Compt. rend. **194,** 863 **1932.**
112. Schiedt, B., Ber. **71,** 1248 **1938.**
113. Schiff, R., Ann. **223,** 247 **1884.**
114. Schmidt, E., J. prakt. Chem. [2] **9,** 241 **1874.**
115. Schmidt, G. A., Ber. **12,** 1153 **1879.**
116. Schmidt, J., Ber. **33,** 3251 **1900.**
117. Schmidt, J., and R. Mezger, Ber. **40,** 4240 **1907.**
118. Schroeter, G., Ber. **57,** 1990 **1924.**
119. Speyers, C. L., J. Am. Chem. Soc. **18,** 146 **1896.**
120. Stohmann, F., C. Kleber, and H. Langbein, J. prakt. Chem. [2] **40,** 77 **1899.**
121. Tammann, G., Nachr. Ges. Wiss. Gottingen, Jahresber. Geschäftsjahr, Math. physik. Klasse, Fachgruppen III **1913,** 335.
122. Terres, E., and W. Vollmer, Petroleum Z. **31,** No. 19, 1 **1935.**
123. Versmann, F., Chem. News **30,** 203 **1874.**
124. von Gerichten, E., Ber. **31,** 3198 **1898.**
125. von Gerichten, E., and F. Schrötter, Ann. **210,** 396 **1881.**
126. von Narbutt, J., Z. physik. Chem. **53,** 697 **1905.**
127. von Steiger, A. L., Ber. **53,** 666 **1920.**
128. von Weimarn, N., Kolloid Z. **54,** 296 **1931.**
129. Waser, E., Helv. Chim. Acta **8,** 758 **1925.**
130. Weger, M., Z. angew. Chem. **22,** 338 **1909.**
131. Weger, M., and K. Döring, Ber. **36,** 878 **1903.**
132. Weiss, J. M., and C. R. Downs, Ind. Eng. Chem. **15,** 1022 **1923.**
133. Weitzenboch, R., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **121,** Abt. IIb, 1227 **1912.**
134. Werner, A., and K. Rekner, Ann. **321,** 273 **1902.**
135. Wolf, K. L., and H. Weghofer, Z. physik. Chem. **39B,** 194 **1938.**
136. Zanetti, J. E., and G. Egloff, Ind. Eng. Chem. **9,** 474 **1917.**
137. Zelinskiĭ, N. D., I. Tits, and M. Gaverdovskaya, Ber. **59,** 2590 **1926.**

$C_{15}H_{12}$

1-Methylphenanthrene



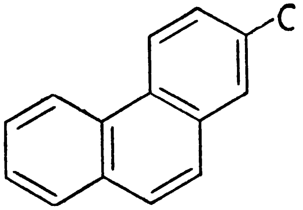
M. P., °C

121.3
123.5[32]
123[100]
122–122.5[56]
120–121[9]
120[54]
119–120[28, 53]
119[68, 82]
118[57, 59]

B. P., °C @ 760mm

354–355 · 763[82]

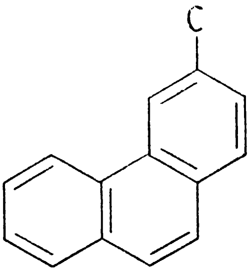
2-Methylphenanthrene



M. P., °C
55.3
56–56.5[93]
56[95]
55–56[31, 57, 124]
54–55[11]
53[83]
52–53[76]

B. P., °C @ 760mm
155–160 3[95]

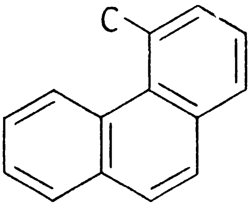
3-Methylphenanthrene



M. P., °C
85[124]
65[82, 100]
62–63[57]
61–62[5]

B. P., °C @ 760mm
350 769[82]

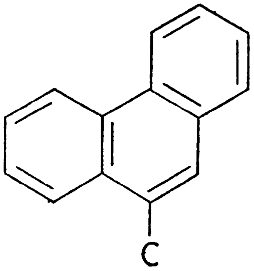
4-Methylphenanthrene



M. P., °C
117[103]
116[34]
49–50[57, 67]

B. P., °C @ 760mm
160 2[34]

9-Methylphenanthrene

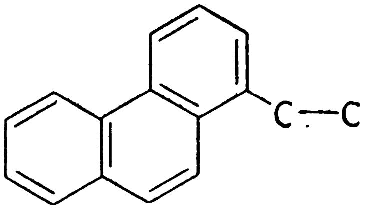


M. P., °C
94
99.5[17]
94[142]
91.5–92.5[26]
92[82]
91–92[86]
90–91[4, 62, 84, 139]
88–89[138]
88[140]

B. P., °C @ 760mm
354–355[82]

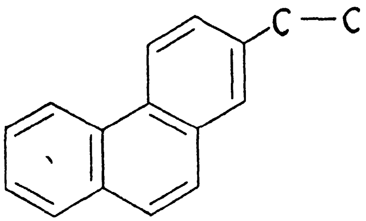
$C_{16}H_{14}$

1-Ethylphenanthrene



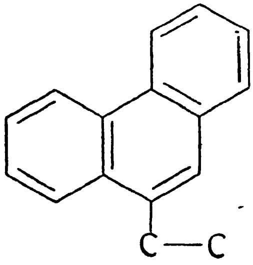
M. P., °C
109–110[101]
108[52]
63.5–64.0[9]
62–63[55]
62.5[64]

2-Ethylphenanthrene



M. P., °C
172–173[101]
67–68[91]
65–66[6]
64–65[63]

9-Ethylphenanthrene



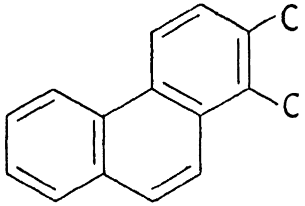
M. P., °C
63
66[16]
63.5–64.5[8]
62.5–63[91]
61–63[102]
61[137]
58–60[86]

B. P., °C @ 760mm
220[15]
198–200 11[102]

D_4^{20}
1.0603 77.5° [81]

n_D^{20}
1.65818 77.5° [81]
1.64834 $n_{H\alpha}^{77.5}$ [81]
1.68588 $n_{H\beta}^{77.5}$ [81]

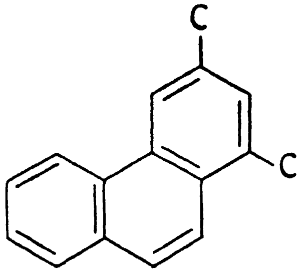
1,2-Dimethylphenanthrene



M. P., °C
142–143[64]
140[29]
139–140[13]

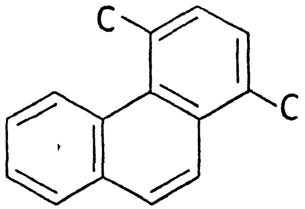
B. P., °C @ 760mm
115–120 2[18]

1,3-Dimethylphenanthrene



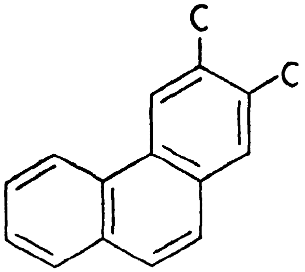
M. P., °C
76–77[24]
75–76[64]

1,4-Dimethylphenanthrene



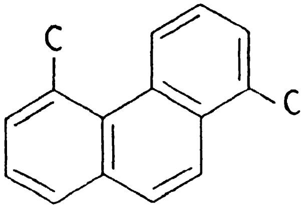
M. P., °C
77[11]
50–51[2]
49.5–50.0[99]

2,3-Dimethylphenanthrene



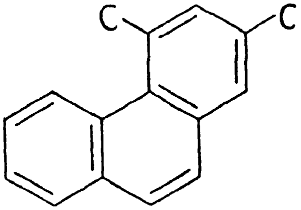
M. P., °C
79–80[65]
78–78.5[48, 50]
77–78[49]
65–66[64]

1,5-Dimethylphenanthrene



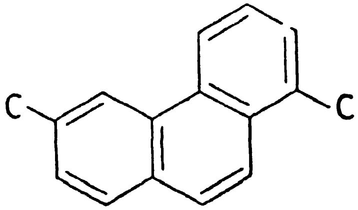
M. P., °C
57–58[64]

2,4-Dimethylphenanthrene



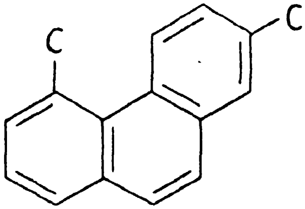
M. P., °C
111[64]

1,6-Dimethylphenanthrene



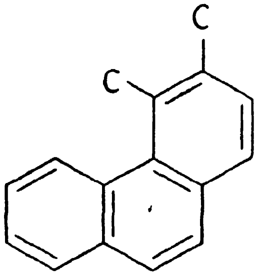
M. P., °C
87–88[64]

2,5-Dimethylphenanthrene



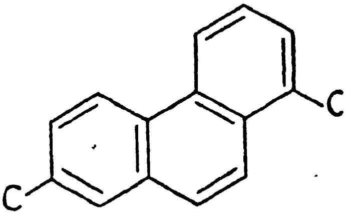
M. P., °C
46–47[64]
B. P., °C @ 760mm
204-205 15[64]

3,4-Dimethylphenanthrene



M. P., °C
62–63[64]

1,7-Dimethylphenanthrene
(Pimanthrene)

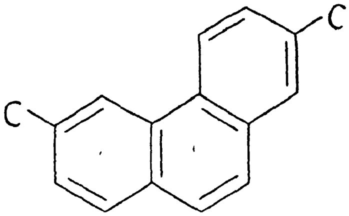


M. P., °C
85 .7
86[11, 27, 114, 119, 120]
85–86[28, 61, 106]
85[75]
79–81[70]
45[88]

B. P., °C @ 760mm

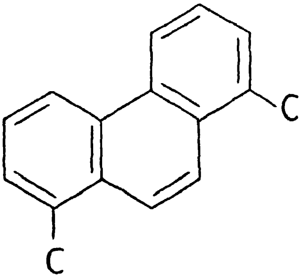
340[88]	
190	0.2[118]
158–160	0.1[69]

2,6-Dimethylphenanthrene



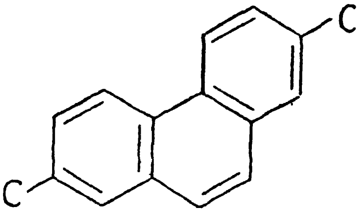
M. P., °C
33–34[64]

1,8-Dimethylphenanthrene



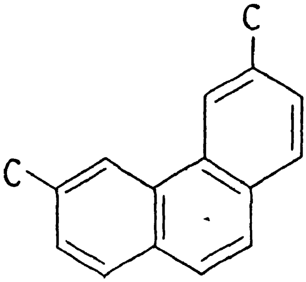
M. P., °C
191–192[64]

2,7-Dimethylphenanthrene



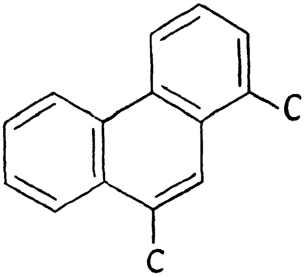
M. P., °C
101–102[64]

3,6-Dimethylphenanthrene



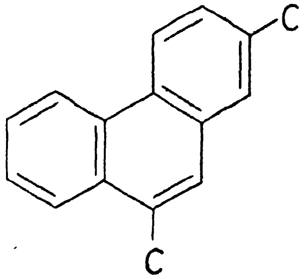
M. P., °C
141[64]

1,9-Dimethylphenanthrene



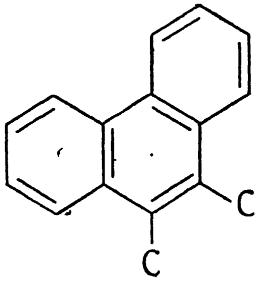
M. P., °C
88[35]
87–88[62]

2,9-Dimethylphenanthrene



M. P., °C
56–57[64]
55–56[124]

9,10-Dimethylphenanthrene



M. P., °C
142.5–143[25A]
139[143]

---

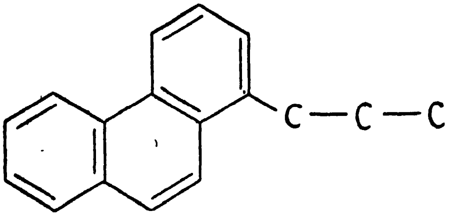
x,x-Dimethylphenanthrene (a)

M. P., °C
126–127[46]

(a) The structure of this compound was not clearly defined in the literature.

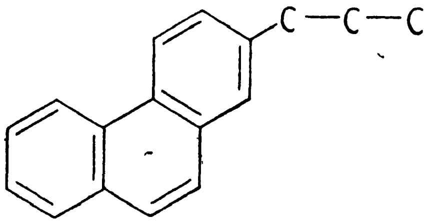
$C_{17}H_{16}$

1-*n*-Propylphenanthrene



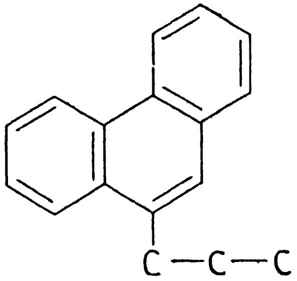
M. P., °C
34–35[64]
32–33[9]

2-*n*-Propylphenanthrene



M. P., °C
35–36[7]

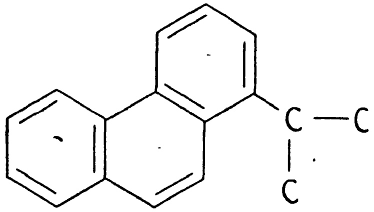
9-*n*-Propylphenanthrene



M. P., °C
74[89]
58.5–59.5[6]
59[3]

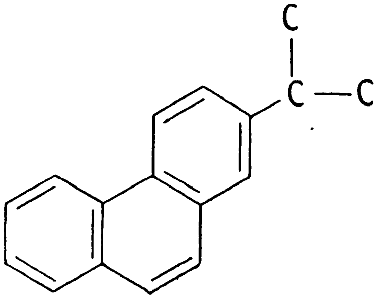
B. P., °C @ 760mm
265–270 22[89]

1-Isopropylphenanthrene



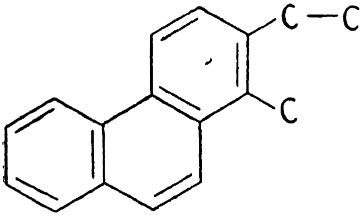
M. P., °C
88–88.5[9]
85–86[64]

2-Isopropylphenanthrene



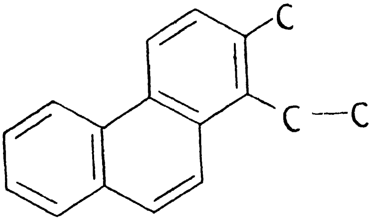
M. P., °C
44–45[64]

1-Methyl-2-ethylphenanthrene



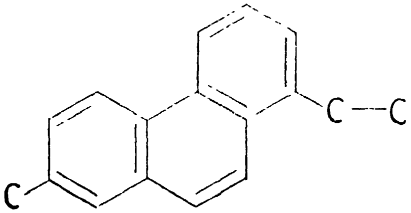
M. P., °C
100[64]

1-Ethyl-2-methylphenanthrene



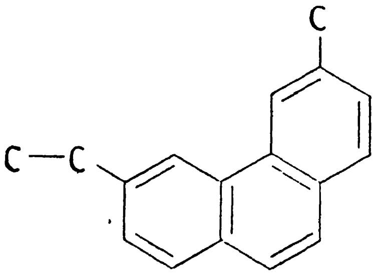
M. P., °C
80[64]

1-Ethyl-7-methylphenanthrene



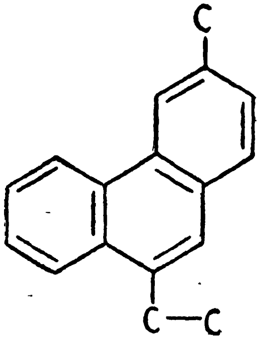
M. P., °C
81[58]
80–81[109]

3-Methyl-6-ethylphenanthrene



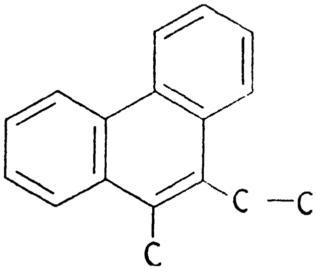
M. P., °C
47–48[5]

3-Methyl-9-ethylphenanthrene



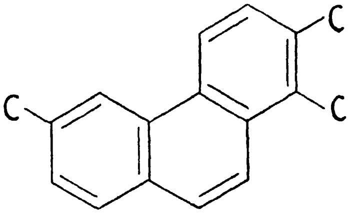
M. P., °C
47–48[5]

9-Methyl-10-ethylphenanthrene



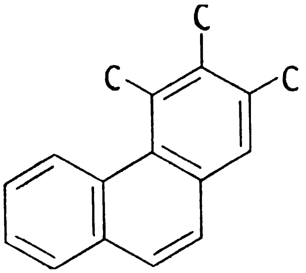
M. P., °C
85[25]

1,2,6-Trimethylphenanthrene



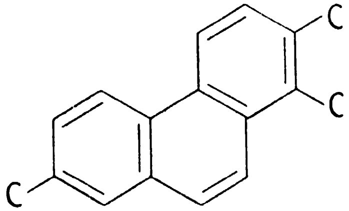
M. P., °C
128.5–129[111]
128–129[113]

2,3,4-Trimethylphenanthrene



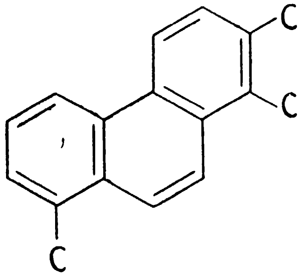
M. P., °C
62.8–63.8[47]

1,2,7-Trimethylphenanthrene



M. P., °C
120–121[60]

1,2,8-Trimethylphenanthrene

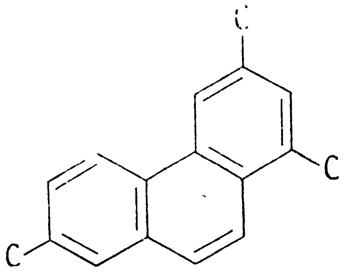


M. P., °C
144
212–213[122]
146–147[112]
144–145[62, 106]
144[71]
142–143[108]
141–142[38]

B. P., °C @ 760mm

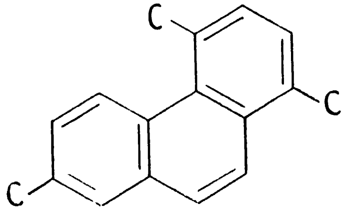
175–180	0.5[71]
160–165	0.2[108]

1,3,7-Trimethylphenanthrene



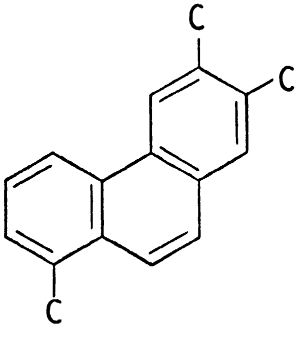
M. P., °C
68–69[60]

1,4,7-Trimethylphenanthrene



M. P., °C
72–73[61]

2,3,8-Trimethylphenanthrene



M. P., °C
123–124[60]

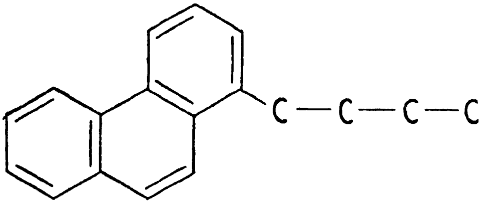
---

x,x,x-Trimethylphenanthrene (a)
M. P., °C
81[105]

(a) The structure of this compound was not clearly defined in the literature.

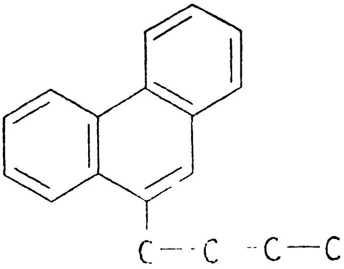
$C_{18}H_{18}$

1-*n*-Butylphenanthrene



M. P., °C
42^{9}

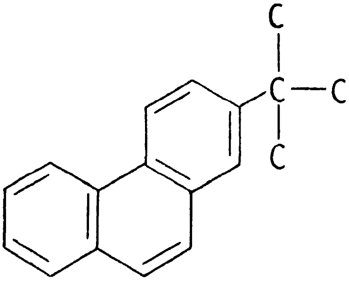
9-*n*-Butylphenanthrene



M. P., °C
78.5–79^{3}
58^{89}

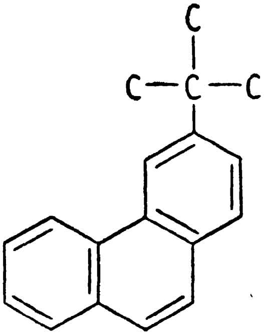
B. P., °C @ 760mm
282–284 20^{89}

2-*tert*-Butylphenanthrene



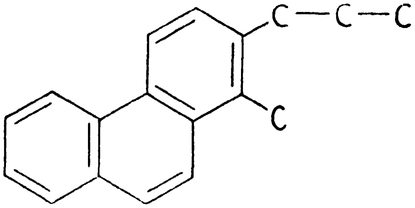
M. P., °C
99–100^{51}

3-*tert*-Butylphenanthrene



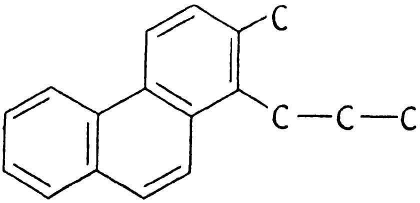
M. P., °C
54–55^{51}

1-Methyl-2-*n*-propylphenanthrene



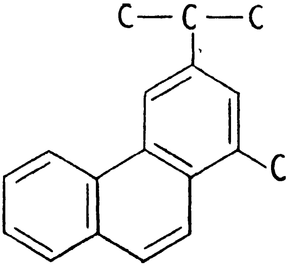
M. P., °C
54^{78}

1-*n*-Propyl-2-methylphenanthrene



M. P., °C
65^{31}

1-Methyl-3-isopropylphenanthrene



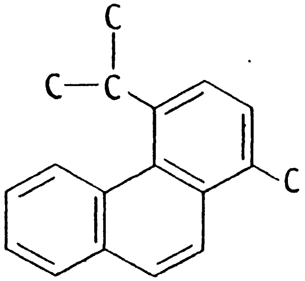
M. P., °C

79[33]

B. P., °C @ 760mm

18	1.5[33]

1-Methyl-4-isopropylphenanthrene

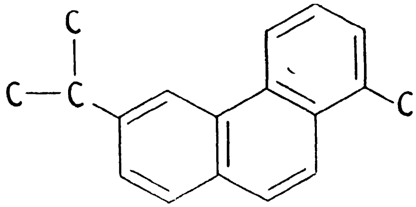


M. P., °C

68–68.5[24]

1-Methyl-6-isopropylphenanthrene (a)

(Isoretene)



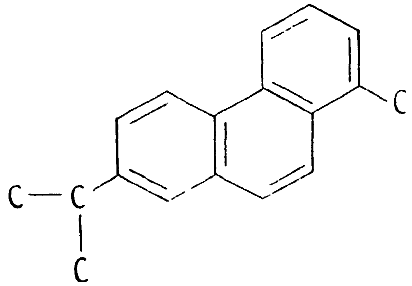
M. P., °C

86–87[14]

(a) The structure of this compound was not clearly defined in the literature.

1-Methyl-7-isopropylphenanthrene

(Retene)



M. P., °C

98.5
100.5–101[115]
100.5[73]
100[126]
99[40, 116, 128]
98.5–99[23, 90, 121]
98–99 (a)
97–99[39, 74]
98.2–98.8[43]
98.5 (b)
98 (c)
97–98[72]
97.5[87]
96[27, 37, 45]
95.2[41, 42]
95[19, 20, 21, 131, 141]

B. P., °C @ 760mm

394	
400[131]	
394[123]	
390–393[93]	
390[22]	
216	11[133]
208–210	10[1, 134]
135	0[80]

D_4^{20}

1.063	98.2–98.8° [43]
1.077	98.2–98.8° [43]
1.067 (solid)	90° [43]
1.093 (solid)	90° [43]
1.0841	25.6° [135]
1.0908	17.5° [135]

n_D^{20}

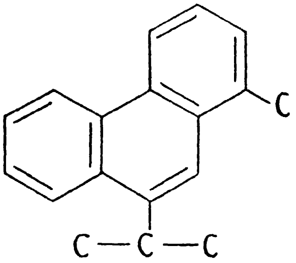
1.61783	$n_{H\alpha}^{25.6}$ [135]
1.62132	$n_{H\alpha}^{17.5}$ [135]
1.64921	$n_{H\beta}^{25.6}$ [135]
1.65286	$n_{H\beta}^{17.5}$ [135]
1.62662	$n_{He}^{25.6}$ [135]
1.63009	$n_{He}^{17.5}$ [135]

(a) The melting point 98–99 is found in references 12, 30, 61, 74, 77, 79, 85, 110, 132, 136.

(b) The melting point 98.5 is found in references 1, 10, 24, 44, 134, 135.

(c) The melting point 98 is found in references 28, 92, 96, 97, 117, 120, 125, 129, 133.

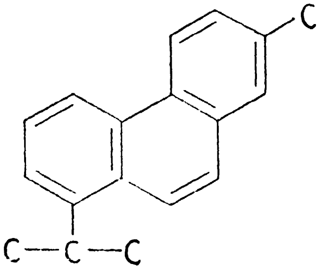
1-Methyl-9-isopropylphenanthrene



B. P., °C @ 760mm

204–205 14[36]

2-Methyl-8-isopropylphenanthrene
(Scianthrene)

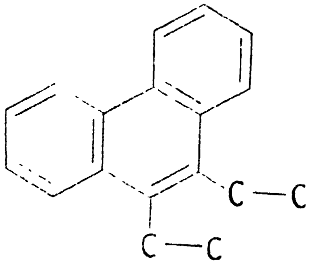


M. P., °C

86–87[130]

82–83[94]

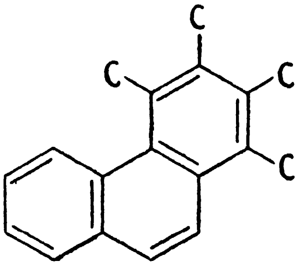
9,10-Diethylphenanthrene



M. P., °C

90–91[137]

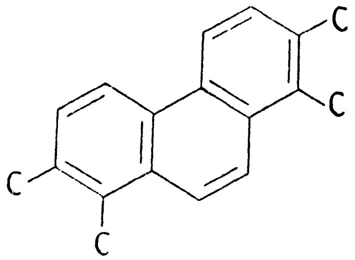
1,2,3,4-Tetramethylphenanthrene



M. P., °C

92–93[66]

1,2,7,8-Tetramethylphenanthrene

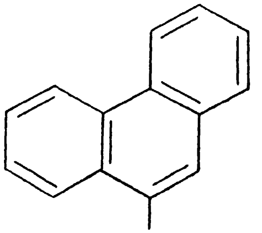


M. P., °C

126–127[107]

$C_{19}H_{20}$

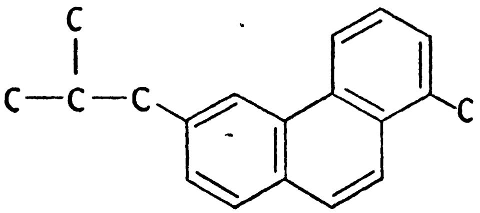
9-*n*-Pentylphenanthrene



M. P., °C

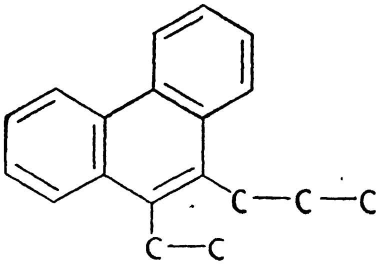
69–70[25A]

1-Methyl-6-isobutylphenanthrene



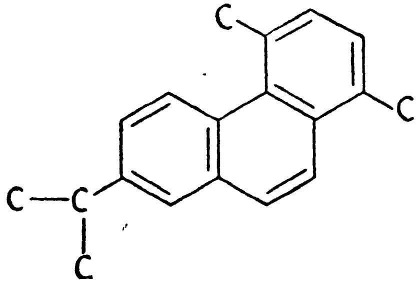
M. P., °C
49–50[104]

9-Ethyl-10-*n*-propylphenanthrene



M. P., °C
69[25]

1,4-Dimethyl-7-isopropylphenanthrene



M. P., °C
61–62[61]

1,x-Dimethyl-7-isopropylphenanthrene (a)
(Methylretene)

M. P., °C
81–82[109]
79[110]
78.5[127]

(a) The structure of this compound was not clearly defined in the literature.

$C_{20}H_{22}$

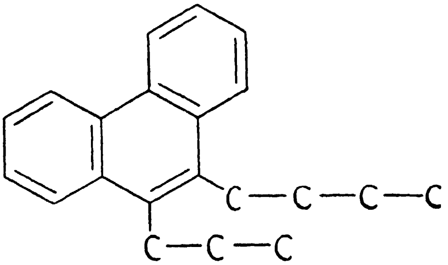
1-Methyl-x-ethyl-7-isopropylphenanthrene (a)

M. P., °C
54–55[28]

(a) The structure of this compound was not clearly defined in the literature.

$C_{21}H_{24}$

9-*n*-Propyl-10-*n*-butylphenanthrene



M. P., °C
74[25]

1-Methyl-7,x-diisopropylphenanthrene (a)
(Isopropylretene)

M. P., °C
52–53[92]

B. P., °C @ 760mm
231–233 9.5[92]

D_4^{20}
1.0125[92]

(a) The structure of this compound was not clearly defined in the literature.

References on $C_{15}H_{12}$–$C_{21}H_{24}$ Compounds

1. Adelson, D. E., and M. T. Bogert, Chem. Revs **24,** 135 **1939.**
2. Akin, R. B., G. S. Stamatoff, and M. T. Bogert, J. Am. Chem. Soc. **59,** 1268 **1937.**
3. Bachman, G. B., and R. I. Hoaglin, J. Am. Chem. Soc. **63,** 621 **1941.**
4. Bachmann, W. E., J. Am. Chem. Soc. **56,** 1363 **1934.**
5. Bachmann, W. E., and G. D. Cortes, J. Am. Chem. Soc. **65,** 1329 **1943.**
6. Bachmann, W. E., and M. W. Cronyn, J. Org. Chem. **8,** 456 **1943.**
7. Bachmann, W. E., and W. S. Struve, J. Org. Chem. **4,** 456 **1939.**

8. Bachmann, W. E., and W. S. Struve, J. Org. Chem. **4,** 472 **1939.**
9. Bachmann, W. E., and A. L. Wilds, J. Am. Chem. Soc. **60,** 624 **1938.**
10. Bamberger, E., and S. C. Hooker, Ann. **229,** 102 **1885.**
11. Bardhan, J. C., and S. C. Sengupta, J. Chem. Soc. **1932,** 2520.
12. Bardhan, J. C., and S. C. Sengupta, J. Chem. Soc. **1932,** 2798.
13. Barker, R. L., and G. R. Clemo, J. Chem. Soc. **1940,** 1277.
14. Beath, G. B., J. Soc. Chem. Ind. **52,** 338T **1933.**
15. Bergmann, E., J. Am. Chem. Soc. **60,** 1798 **1938.**
16. Bergmann, E., and F. Bergmann, J. Am. Chem. Soc. **59,** 1443 **1937.**
17. Bergmann, E., and F. Bergmann, J. Chem. Soc. **1939,** 1019.
18. Bergmann, E., and A. Weizmann, J. Org. Chem. **4,** 266 **1939.**
19. Berthelot, Ann. chim. phys. [4] **12,** 173 **1867.**
20. Berthelot, Ann. chim. phys. [4] **12,** 193 **1867.**
21. Berthelot, Bull. soc. chim. [2] **7,** 43 **1867.**
22. Berthelot through D. E. Adelson and M. T. Bogert, Chem. Revs. **24,** 135 **1939.**
23. Bogert, M. T., and T. Hasselström, J. Am. Chem. Soc. **53,** 3462 **1931.**
24. Bogert, M. T., and G. S. Stamatoff, Rec. trav. chim. **52,** 584 **1933.**
25. Bradsher, C. K., and S. T. Amore, J. Am. Chem. Soc. **65,** 2016 **1943.**
25A. Bradsher, C. K., and S. T. Amore, J. Am. Chem. Soc. **66,** 1280 **1944.**
26. Bradsher, C. K., and R. W. H. Tess, J. Am. Chem. Soc. **61,** 2184 **1939.**
27. Brandt, C. W., New Zealand J. Sci. Tech. **20,** 8B **1938;** Chem. Zentr. **1939,** II, 856.
28. Brandt, C. W., and L. G. Neubauer, J. Chem. Soc. **1939,** 1031.
29. Butenandt, A., H. A. Weidlich, and H. Thompson, Ber. **66,** 601 **1933.**
30. Cheung, L. M., Bull. inst. pin. **1929,** 108.
31. Cohen, A., J. W. Cook, and C. L. Hewett, J. Chem. Soc. **1935,** 1633.
32. Darzens, G., and A. Lévy, Compt. rend. **200,** 2187 **1935.**
33. Darzens, G., and A. Lévy, Compt. rend. **201,** 152 **1935.**
34. Darzens, G., and A. Lévy, Compt. rend. **201,** 730 **1935.**
35. Darzens, G., and A. Lévy, Compt. rend. **202,** 427 **1936.**
36. Darzens, G., and A. Lévy, Compt. rend. **203,** 669 **1936.**
37. Diels, O., and A. Karstens, Ber. **60,** 2323 **1927.**
38. Drake, N. L., and W. T. Haskins, J. Am. Chem. Soc. **58,** 1684 **1936.**
39. Easterfield, T. H., and G. Bagley, J. Chem. Soc. **85,** 1238 **1904.**
40. Easterfield, T. H., and G. Bagley, Proc. Chem. Soc. **20,** 112 **1904.**
41. Efremov, N. N., and A. M. Tikhomirova, Ann. inst. anal. phys. chim. (U.S.S.R.) **4,** 92 **1928;** C.A. **23,** 3214 **1929;** Chem. Zentr. **1929,** I, 745.
42. Efremov, N. N., and A. N. Tikhomirova, J. Russ. Phys. Chem. Soc. **59,** 373 **1927;** C.A. **22,** 2508 **1928.**
43. Ekstrand, A. G., Ann. **185,** 75 **1877.**
44. Ekstrand, A. G., Ber. **9,** 855 **1876.**
45. Ekstrand, A. G., Ber. **17,** 692 **1884.**
46. Elderfield, R. C., and W. A. Jacobs, J. Biol. Chem. **107,** 143 **1934.**
47. Fieser, L. F., and W. H. Daudt, J. Am. Chem. Soc. **63,** 782 **1941.**
48. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **57,** 1508 **1935.**
49. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **57,** 2192 **1935.**
50. Fieser, L. F., and H. L. Holmes, J. Am. Chem. Soc. **58,** 2319 **1936.**
51. Fieser, L. F., and C. C. Price, J. Am. Chem. Soc. **58,** 1838 **1936.**
52. Gadamer, J., M. Oberlin, and A. Schoeler, Arch. pharm. **263,** 81 **1925.**
53. Grewe, R., Ber. **72,** 785 **1939.**
54. Grewe, R., Ber. **72,** 1314 **1939.**
55. Grewe, R., Ber. **76,** 1072 **1943.**
56. Hasselstrom, T., J. Am. Chem. Soc. **63,** 1164 **1941.**
57. Haworth, R. D., J. Chem. Soc. **1932,** 1125.
58. Haworth, R. D., J. Chem. Soc. **1932,** 2717.

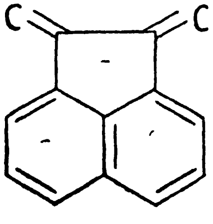
59. Haworth, R. D., and R. L. Barker, J. Chem. Soc. **1939,** 1299.
60. Haworth, R. D., and F. M. Bolam, J. Chem. Soc. **1932,** 2248.
61. Haworth, R. D., B. M. Letsky, and C. R. Mavin, J. Chem. Soc. **1932,** 1784.
62. Haworth, R. D., and C. R. Mavin, J. Chem. Soc. **1932,** 2720.
63. Haworth, R. D., and C. R. Mavin, J. Chem. Soc. **1933,** 1012.
64. Haworth, R. D., C. R. Mavin, and G. Sheldrick, J. Chem. Soc. **1934,** 454.
65. Haworth through L. F. Fieser and E. B. Hershberg, J. Am. Chem. Soc. **57,** 2192 **1935.**
66. Hewett, C. L., and R. M. Martin, J. Chem. Soc. **1940,** 1396.
67. Hill, P., W. F. Short, and A. Higginbottom, J. Chem. Soc. **1936,** 317.
68. Hoch, J., Compt. rend. **205,** 65 **1937.**
69. Hosking, J. R., Ber. **69,** 780 **1936.**
70. Hosking, J. R., Rec. trav. chim. **49,** 1036 **1930.**
71. Hosking, J. R., and C. W. Brandt, Ber. **68,** 37 **1935.**
72. Hosking, J. R., and W. T. McFadyen, J. Soc. Chem. Ind. **53,** 195T **1934.**
73. Jezierski, T. W., Roczniki Chem. **13,** 720 **1933;** C.A. **28,** 6048 **1934;** Chem. Zentr. **1934,** I, 2622.
74. Keimatsu, S., and T. Ishiguro, J. Pharm. Soc. Japan **55,** 99, 186 **1935;** C.A. **29,** 7323 **1935;** Chem. Zentr. **1935,** II, 3663.
75. Keimatsu, S., T. Ishiguro, and G. Fukui, J. Pharm. Soc. Japan **57,** 92 **1937;** Chem. Zentr. **1937,** II, 596.
76. Klinckhard, T., Ann. **379,** 362 **1911.**
77. Komppa, G., and E. Wahlforss, J. Am. Chem. Soc. **52,** 5009 **1930.**
78. Kon, G. A. R., E. S. Narracott, and C. Reid, J. Chem. Soc. **1938,** 778.
79. Kono, M., and R. Maruyama, J. Agr. Chem. Soc. Japan **12,** 512 **1936;** C. A. **30,** 6747 **1936.**
80. Krafft, F., and H. Weilard, Ber. **29,** 2240 **1896.**
81. Krollpfeiffer, F., Ann. **430,** 161 **1923.**
82. Kruber, O., and A. Marx, Ber. **71,** 2478 **1938.**
83. Laucht, F., Z. physiol. Chem. **237,** 236 **1935.**
84. Levitz, M., and M. T. Bogert, J. Org. Chem. **8,** 253 **1943.**
85. Manzoni-Ansidei, R., Gazz. chim. ital. **67,** 790 **1937.**
86. Marvel, C. S., D. E. Pearson, and R. V. White, J. Am. Chem. Soc. **62,** 2741 **1940.**
87. McVicker, W. H., J. K. Marsh, and A. W. Stewart, J. Chem. Soc. **127,** 999 **1925.**
88. Meyer, H., Z. angew. Chem. **37,** 796 **1924.**
89. Miller, H. F., and J. Bachman, J. Am. Chem. Soc. **57,** 766 **1935.**
90. Morgenstern, O., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **120,** Abt. IIb, 523 **1911.**
91. Mosettig, E., and J. van de Kamp, J. Am. Chem. Soc. **55,** 3442 **1933.**
92. Nyman, G. A., Ann. Acad. Sci. Fennicae **41A,** No. 5, **1935;** C.A. **30,** 2958 **1936;** Chem. Zentr. **1936,** I, 2348.
93. Olsson, J., Ing. Vetenskaps Akad. Handl. **1931,** No. 111.
94. Orcutt, R. M., and M. T. Bogert, J. Am. Chem. Soc. **63,** 127 **1941.**
95. Orcutt, R. M., and M. T. Bogert, J. Org. Chem. **4,** 543 **1939.**
96. Pascal, P., Bull. soc. chim. [4] **29,** 644 **1921.**
97. Paul, L., Seifensieder-Ztg. **42,** 393, 412, 434 **1915;** Chem. Zentr. **1915,** II, 188.
98. Perlman, D., and M. T. Bogert, J. Am. Chem. Soc. **59,** 2534 **1937.**
99. Popa, D., D. Perlman, and M. T. Bogert, J. Am. Chem. Soc. **60,** 319 **1938.**
100. Pschorr, R., Ber. **39,** 3106 **1906.**
101. Pschorr, R., Ber. **39,** 3124 **1906.**
102. Pschorr, R., Ber. **39,** 3128 **1906.**
103. Radcliffe, C. B., I. R. Sherwood, and W. F. Short, J. Chem. Soc. **1931,** 2293.
104. Ruzicka, L., R. G. R. Bacon, R. Lukas, and J. D. Rose, Helv. Chim. Acta **21,** 583 **1938.**
105. Ruzicka, L., and F. Balas, Helv. Chim. Acta **7,** 875 **1924.**
106. Ruzicka, L., L. L. Engel, and W. H. Fischer, Helv. Chim. Acta **21,** 364 **1938.**

107. Ruzicka, L., M. Goldberg, and K. Hofmann, Helv. Chim. Acta **20,** 325 **1937.**
108. Ruzicka, L., and J. R. Hosking, Helv. Chim. Acta **14,** 203 **1931.**
109. Ruzicka, L., and H. Jacobs, Rec. trav. chim. **57,** 509 **1938.**
110. Ruzicka, L., and J. Meyer, Helv. Chim. Acta **5,** 581 **1922.**
111. Ruzicka, L., E. Rey, and W. J. Smith, Helv. Chim. Acta **26,** 2057 **1943.**
112. Ruzicka, L., E. Rey, and M. Spillmann, Helv. Chim. Acta **25,** 1375 **1942.**
113. Ruzicka, L., and W. J. Smith, Chem. and Ind. **16,** II, 1210 **1938.**
114. Ruzicka, L., R. Steiger, and H. Schinz, Helv. Chim. Acta **9,** 962 **1926.**
115. Ruzicka, L., and H. Waldmann, Helv. Chim. Acta **16,** 842 **1933.**
116. Ruzicka, L., and E. Waldmann, Helv. Chim. Acta **18,** 611 **1935.**
117. Ruzicka, L., H. Waldmann, P. J. Meier, and H. Hösli, Helv. Chim. Acta **16,** 169 **1933.**
118. Schmid, L., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **148,** Abt. IIb, 9 **1939.**
119. Schmid, L., and E. Erdos, Ann. **503,** 269 **1933.**
120. Schmid, L., and W. Hosse, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **147,** Abt. IIb, 366 **1939.**
121. Schultze, W., Ann. **359,** 129 **1908.**
122. Schulze, H., Z. physiol. Chem. **238,** 35 **1936.**
123. Schweitzer, R., Ann. **264,** 193 **1891.**
124. Sengupta, S. C., J. prakt. Chem. [2] **152,** 9 **1939.**
125. Soltys, A., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **138 suppl.,** Abt. IIb, 175 **1929.**
126. Sterling, E. C., and M. T. Bogert, J. Org. Chem. **4,** 20 **1939.**
127. Suzucki, K., Sci. Papers Inst. Phys. Chem. Research (Tokyo) **26,** 98 **1935.**
128. Trost, F., Ann. chim. applicata **25,** 496 **1935.**
129. Tschirch, A., and F. Koritschoner, Arch. pharm. **240,** 568 **1902.**
130. Uota, H., J. Dept. Agr. Kyushu Imp. Univ. **5,** 117 **1937.**
131. Versmann, F., Chem. News **30,** 203 **1874.**
132. Vesterberg, A., Ber. **36,** 4200 **1903.**
133. Vesterberg, K. A., and E. Borge, Ann. **440,** 305 **1924.**
134. Virtanen, A. J., Ber. **53,** 1880 **1920.**
135. von Auwers, K., and R. Kraul, Ann. **443,** 181 **1925.**
136. Wahlforss, A., Z. Chem. **12** [5], 73 **1869.**
137. Willgerodt, C., and B. Albert, J. prakt. Chem. [2] **84,** 383 **1911.**
138. Windaus, A., Ann. **439,** 59 **1924.**
139. Windaus, A., H. Jensen, and A. Schramme, Ber. **57,** 1875 **1924.**
140. Windaus, A., and H. Schiele, Nachr. Ges. Wiss. Göttingen, Jahresber. Geschäftsjahr **1923,** 17; Chem. Zentr. **1923,** III, 673.
141. Zeidler, O., Ann. **191,** 285 **1878.**
142. Zelinskiĭ, N. D., and M. V. Gaverdovskaya, Ber. **61,** 1049 **1928.**
143. Zincke, T., and W. Tropp, Ann. **362,** 242 **1908.**

4. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-18}

$C_{14}H_{10}$

1,2-Dimethyleneacenaphthene



M. P., °C

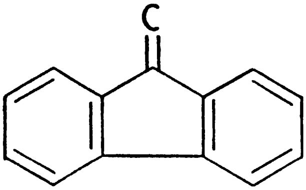
184 (a)[41]

158 (b)[41]

(a) This constant was determined on the *trans* isomer of the compound.

(b) This constant was determined on the *cis* isomer of the compound.

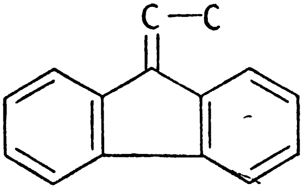
9-Methylenefluorene



M. P., °C
104–106[39]
53[23, 78]
46–48[59]

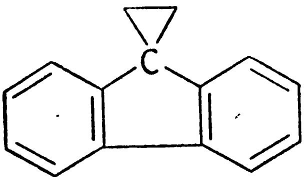
$C_{15}H_{12}$

9-Ethylidenefluorene



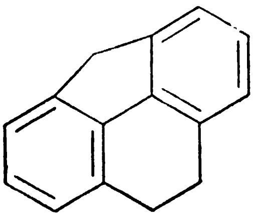
M. P., °C
104[18, 20, 64, 66, 67]
102[51]
100[42]

Spiro[fluorene-9,1′-cyclopropane]



M. P., °C
73–73.5[77]

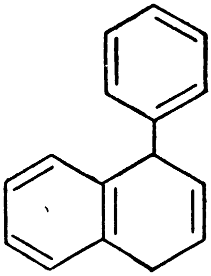
Cyclopentano-[def]-9,10-dihydrophenanthrene



M. P., °C
140.5–141.2[26]

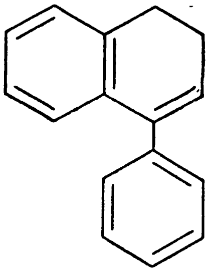
$C_{16}H_{14}$

1-Phenyl-1,4-dihydronaphthalene



M. P., °C
50[63]

4-Phenyl-1,2-dihydronaphthalene



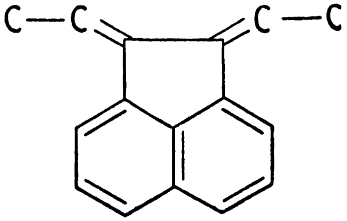
B. P., °C @ 760mm

302[75]	
175–177	12[76]
186–188	10[68]

D_4^{20}

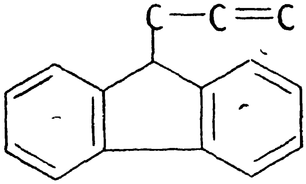
1.0784	27° [70]

1,2-Diethylideneacenaphthene



M. P., °C
140[40]

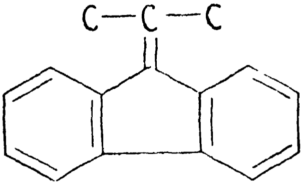
9-(Propen-2′-yl)-fluorene



B. P., °C @ 760mm

174–176	15[79]

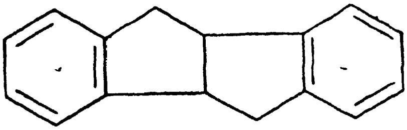
9-Isopropylidenefluorene



M. P., °C
113–117[30, 38]
113 (a)[55]
89 (a)[18]

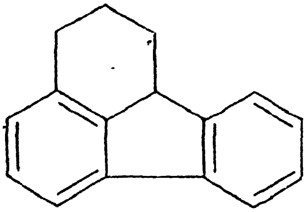
(a) These constants were determined on stereoisomers.

2,3,6,7-Dibenzobicyclo-[3,3,0]-octane



M. P., °C
102[5]
100[53]

Cyclohexano-[jk]-fluorene

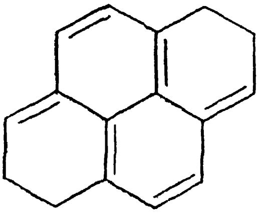


M. P., °C
75
76[36]
75[35]
74–75[74]
73–74[73]

B. P., °C @ 760mm

363–365	749[35]
203–205	12[74]
200–205	12[73]
155	0.7[69]

1,2,6,7-Tetrahydropyrene



M. P., °C
138[17]

---

x_4-Tetrahydropyrene (a)

M. P., °C
84[45]

(a) The structure of this compound was not clearly defined in the literature.

$C_{17}H_{16}$

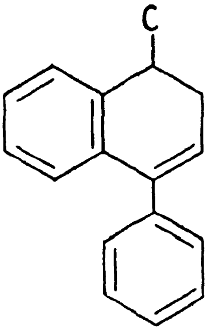
x-Phenethenylindane (a)

B. P., °C @ 760mm

198–201	18[60]

(a) The structure of this compound was not clearly defined in the literature.

1-Methyl-4-phenyl-1,2-dihydronaphthalene

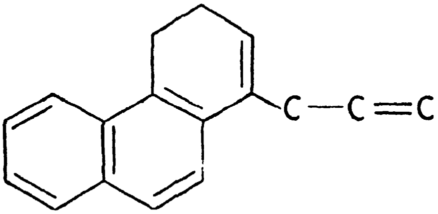


M. P., °C
48[70]

B. P., °C @ 760mm
185–188 14[70]

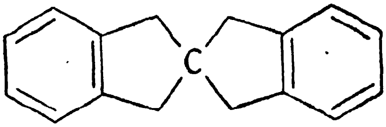
D_4^{20}
1.0513 22°[70]

1-(Propen-2′-yl)-3, 4-dihydrophenanthrene



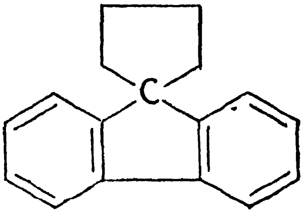
M. P., °C
129–130.5[56]

Spiro[indane-2,2′-indane]



M. P., °C
66–67[37]

Spiro[fluorene-9,1′-cyclopentane]



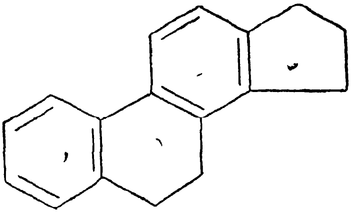
M. P., °C
91[2]

x_4-Tetrahydro-x,x-benzofluorene (a)

M. P., °C
129[34]

(a) The structure of this compound was not clearly defined in the literature.

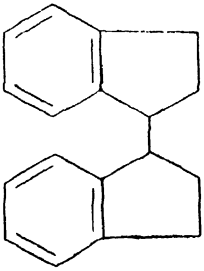
1,2-Cyclopentano-9,10-dihydrophenanthrene



M. P., °C
65–69[11]

$C_{18}H_{18}$

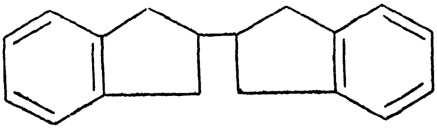
1,1′-Biindanyl



B. P., °C @ 760mm
194–195 14[62]

D_4^{20}
1.0669 24°[62]

2,2′-Biindanyl

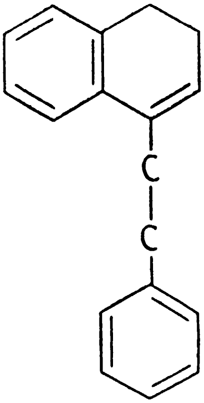


M. P., °C
165–166[24, 25]

B. P., °C @ 760mm

239–241	50[61]
225–226	20[61]

4-Phenethyl-1,2-dihydronaphthalene



M. P., °C

209–212	16[15]
165–168	12[54]

---

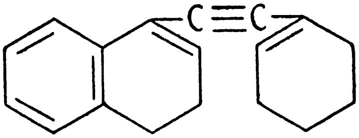
x-Phenethenyl-1,2,3,4-tetrahydronaphthalene (a)

B. P., °C @ 760mm

216–218	18[60]

(a) The structure of this compound was not clearly defined in the literature.

Cyclohexen-1-yl-[4′-(1′,2′-dihydronaphthyl)]-ethyne



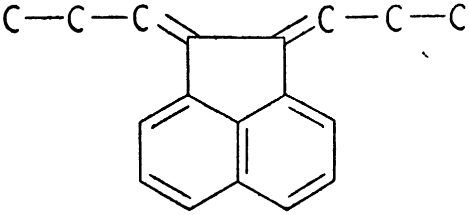
B. P., °C @ 760mm

170–172	2[46]

D_4^{20}
1.0443[46]

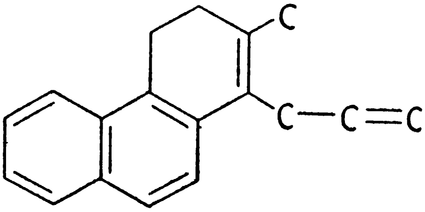
n_D^{20}
1.6186[46]

1,2-Dipropylideneacenaphthene



M. P., °C
101[41]

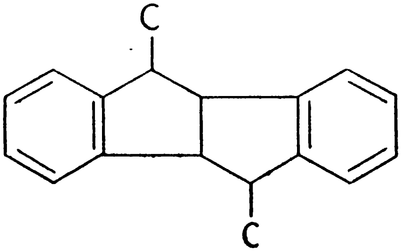
1-(Propen-2′-yl)-2-methyl-3,4-dihydrophenanthrene



B. P., °C @ 760mm

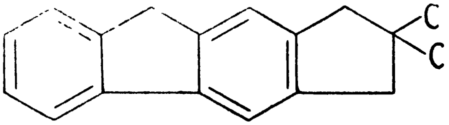
177–179	0.6[12]

2,3,6,7-Dibenzo-4,8-dimethylbicyclo-[3,3,0]-octane



M. P., °C
94[7]

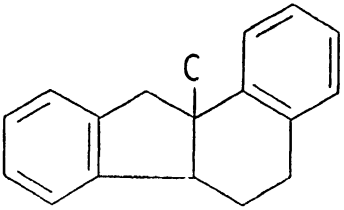
2,3-(4′,4′-Dimethylcyclopentano)-fluorene



M. P., °C
135–137 (a)[32]
128–129 (a)[32]

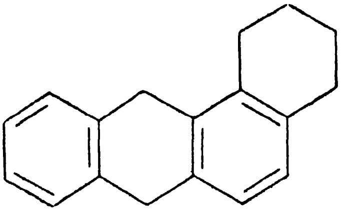
(a) These constants were determined on different forms.

1,2-Benzo-9a-methyl-3,4,4a,9a-tetrahydrofluorene



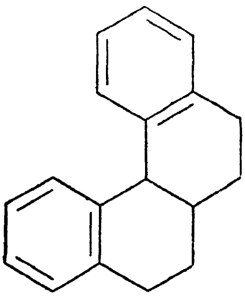
B.P., °C @ 760mm
159 0.8[16]

1,2-Cyclohexano-9,10-dihydroanthracene



M. P., °C
69.3–69.9[29]

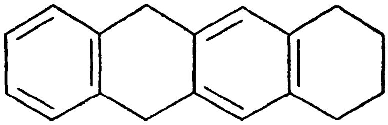
3,4-Benzo-1,2,4a,9,10,10a-hexahydrophenanthrene



M. P., °C
47.5–48[33]

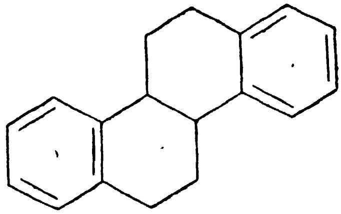
B. P., °C @ 760mm
148–153 0.2[33]

1,2,3,4,6,11-Hexahydronaphthacene



M. P., °C
128[71]

4b,5,6,10b,11,12-Hexahydrochrysene



M. P., °C
140 (a)[4]
115 (a)[50]
112 (a)[49]
79 (a)[49]
76.8–77.8 (b)[44]
75 (b)[4, 50]

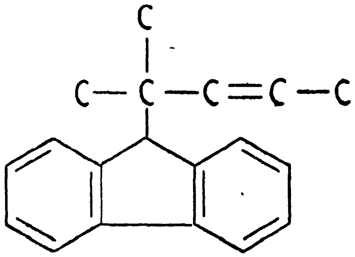
B. P., °C @ 760mm
223 (a) 12[50]
208 (b) 12[50]

(a) These constants were determined on the *trans* isomer of the compound.

(b) These constants were determined on the *cis* isomer of the compound.

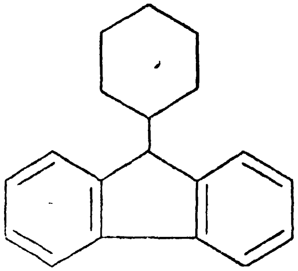
$C_{19}H_{20}$

2-Methyl-2-(9′-fluoryl)-pentene-3



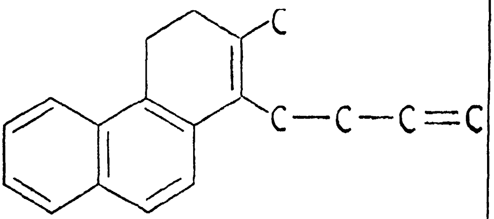
M. P., °C
92^{31}

9-Cyclohexylfluorene



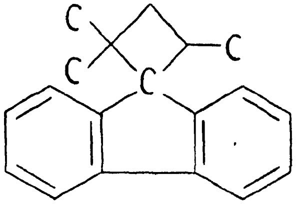
M. P., °C
$115\text{–}116^{9}$
$102\text{–}103^{13}$

1-(Buten-3′-yl)-2-methyl-3,4-dihydrophenanthrene



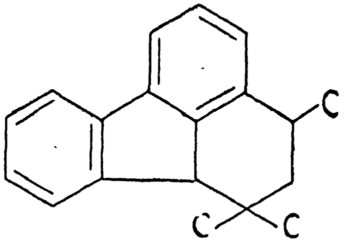
B. P., °C @ 760mm
155–160 0.3^{12}

Spiro[2,2,4-trimethylcyclobutane-1,9′-fluorene]



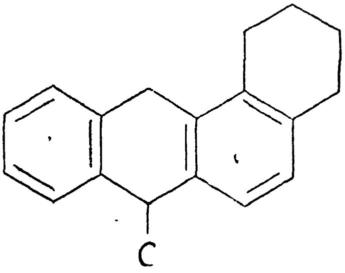
M. P., °C
$92\text{–}94^{31}$

Benzo-[lm]-2,4,4-trimethyl-2,3,4,4a-tetrahydrofluorene



M. P., °C
$103\text{–}104^{31}$

1,2-Cyclohexano-10-methyl-9,10-dihydroanthracene



M. P., °C
$155.5\text{–}156^{29}$

$C_{20}H_{22}$

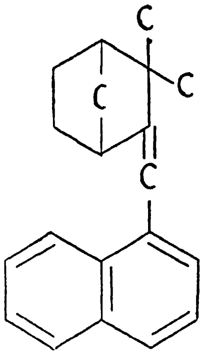
x-Naphthyl-2,2-dimethyl-3-methylenebicyclo-[2,2,1]-heptane (a)

M. P., °C
$92\text{–}93^{8}$

B. P., °C @ 760mm
210 16^{8}

(a) The structure of this compound was not clearly defined in the literature.

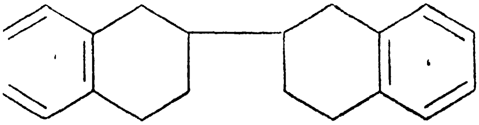
2,2-Dimethylbicyclo-[2,2,1]-heptyliden-3-yl-(1′-naphthyl)-methane



B. P., °C @ 760mm
186.5–188 1[1]

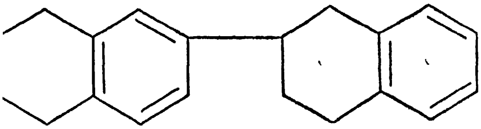
D_4^{20}
1.0525 D_0^{20}

Bi-2,2′-(1,2,3,4-tetrahydronaphthyl)



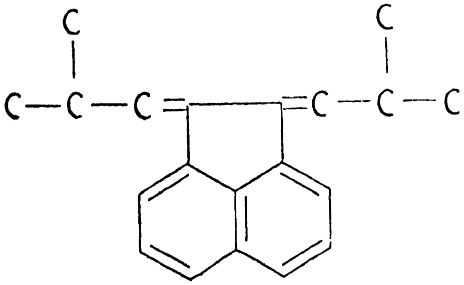
M. P., °C
113[72]

Bi-2,6′-(1,2,3,4-tetrahydronaphthyl)



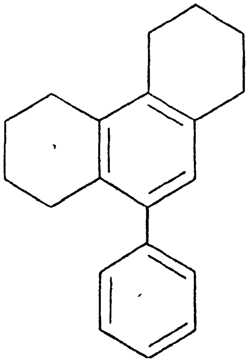
M. P., °C
53–54[57]

1,2-Diisobutylideneacenaphthene



B. P., °C @ 760mm
215 15[41]

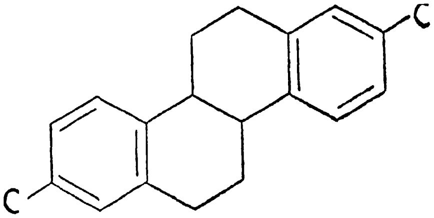
9-Phenyl-1,2,3,4,5,6,7,8-octahydrophenanthrene



M. P., °C
94[22]

B. P., °C @ 760mm
186 0.2[22]

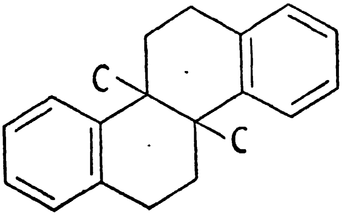
2,8-Dimethyl-4b,5,6,10b,11,12-hexahydrochrysene



M. P., °C
140 (a)[49]
108 (a)[49]

(a) These constants were determined on different forms.

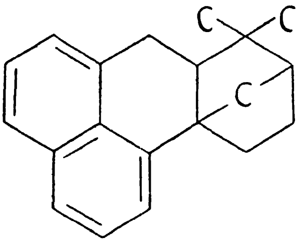
4b,10b-Dimethyl-4b,5,6,10b,11,12-hexahydrochrysene



M. P., °C
144 (a)[49]
105 (a)[49]

(a) These constants were determined on different forms.

Benzo-[fg]-1,1-dimethyl-2,4a-methylene-1,2,3,4,4a,9,9a-heptahydroanthracene (a)



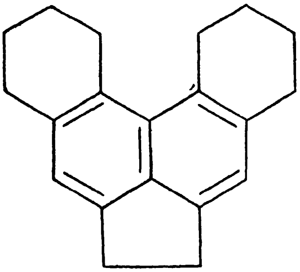
B. P., °C @ 760mm
185–186 1[1]

D_4^{20}
1.0991 D_0^{20} [1]

n_D^{20}
1.6205[1]

(a) The structure of this compound was not clearly defined in the literature.

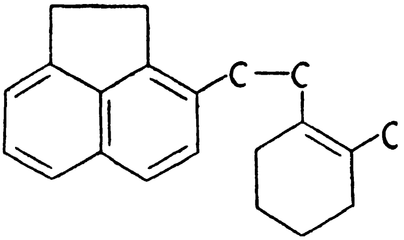
Cyclohexano-[g]-cyclopentano-[jk]-1,2,3,4-tetrahydrophenanthrene



M. P., °C
148.6–149.0[28]

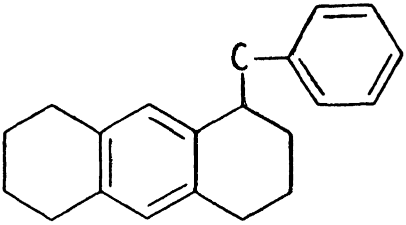
$C_{21}H_{24}$

1-(3′-Acenaphthyl)-2-(2″-methylcyclohexen-1″-yl)-ethane



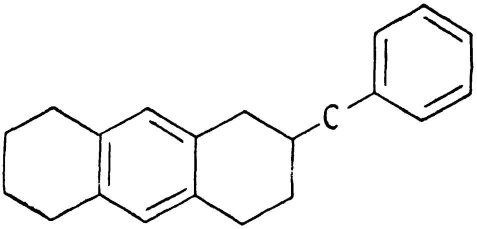
B. P., °C @ 760mm
182–185 0.2–0.3[14]

1-Benzyl-1,2,3,4,5,6,7,8-octahydroanthracene



B. P., °C @ 760mm
244–246 14[58]

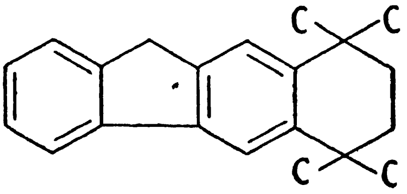
2-Benzyl-1,2,3,4,5,6,7,8-octahydroanthracene



M. P., °C
65–66[58]

B. P., °C @ 760mm
248–251 12[58]

2,3-(3′,3′,6′,6′-Tetramethylcyclohexano)-fluorene



M. P., °C
93–94[10]

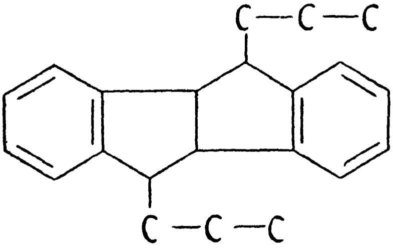
$C_{22}H_{26}$

1,1-Di-[x′-(x′$_4$-tetrahydronaphthyl)]-ethane (a)

B. P., °C @ 760mm
384[52]
261–263 16[52]

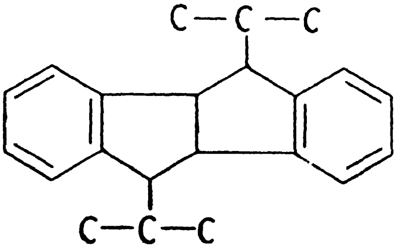
(a) The structure of this compound was not clearly defined in the literature.

3,4,7,8-Dibenzo-2,6-di-*n*-propylbicyclo-[3,3,0]-octane
(9,12-Di-*n*-propyldiphensuccindane)



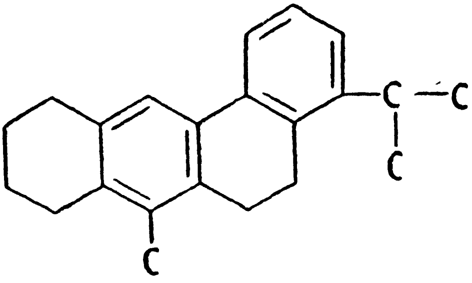
M. P., °C
98–99[6]

3,4,7,8-Dibenzo-2,6-diisopropylbicyclo-[3,3,0]-octane
(9,12-Diisopropyldiphensuccindane)



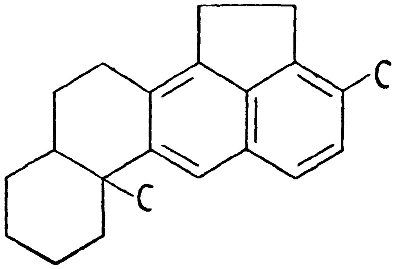
M. P., °C
80–81[6]

1-Isopropyl-6,7-cyclohexano-8-methyl-9,10-dihydrophenanthrene



M. P., °C
44.8–46[27]

3,6b-Dimethyl-6b,7,8,9,10,10a,11,12-octahydrocholanthrene



M. P., °C
132–134[13]

$C_{28}H_{38}$

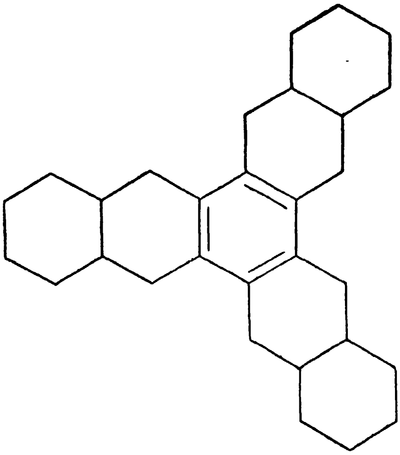
x,x,x-Tricyclohexylnaphthalene (a)

M. P., °C
121–122[47]

(a) The structure of this compound was not clearly defined in the literature.

$C_{30}H_{42}$

1,2,3,4,5,6-Tri-(3′,2′-octahydronaphtho)-benzene



M. P., °C
360–362[48]

$C_{33}H_{48}$

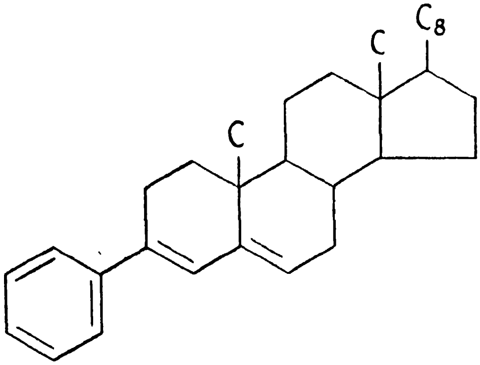
3-Phenylcholestadiene-2,4 (a)

M. P., °C
174–175[65]

Additional Data
$[\alpha]^{29}_{D} = -133°$ [65]

(a) The structure of this compound was not clearly defined in the literature.

3-Phenylcholestadiene-3,5

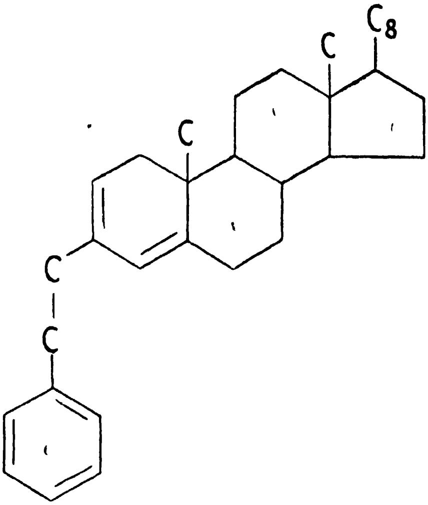


M. P., °C
158–159[3]

Additional Data
$[\alpha]^{25}_{D} = -132°$ [3]

$C_{35}H_{52}$

3-Phenethylcholestadiene-2,4



M. P., °C
94–95[19]

$C_{36}H_{54}$

Phenylfriedelene (a)

M. P., °C
269–271[21]

(a) The structure of this compound was not clearly defined in the literature.

References on Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-18}

1. Arbusov, B. A., J. Gen. Chem. (U.S.S.R.) **9**, 239 **1939**; Chem. Zentr. **1939**, II, 1284.
2. Bachmann, W. E., and M. C. Kloetzel, J. Am. Chem. Soc. **59**, 2207 **1937**.
3. Bergmann, W., and F. Hirschmann, J. Org. Chem. **4**, 40 **1939**.
4. Bernal, J. D., Chemistry & Industry **52**, 288 **1933**.
5. Brand, K., and K. O. Müller, Ber. **55**, 601 **1922**.
6. Brand, K., and T. Sasaki, Ber. **58**, 2546 **1925**.

7. Brand, K., and F. Schläger, Ber. **56,** 2541 **1923.**
8. Bredt, J., J. prakt. Chem. [2] **98,** 96 **1918.**
9. Brown, W. G., and B. A. Bluestein, J. Am. Chem. Soc. **65,** 1082 **1943.**
10. Bruson, H. A., and J. W. Kroeger, J. Am. Chem. Soc. **62,** 36 **1940.**
11. Burger, A., and E. Mosettig, J. Am. Chem. Soc. **59,** 1302 **1937.**
12. Cohen, A., J. W. Cook, and C. L. Hewett, J. Chem. Soc. **1935,** 1633.
13. Cook, J. W., and G. A. D. Haslewood, J. Chem. Soc. **1934,** 428.
14. Cook, J. W., G. A. D. Haslewood, and A. M. Robinson, J. Chem. Soc. **1935,** 667.
15. Cook, J. W., and C. L. Hewett, J. Chem. Soc. **1934,** 365.
16. Cook, J. W., C. L. Hewett, W. V. Mayneord, and E. Roe, J. Chem. Soc. **1934,** 1727.
17. Coulson, E. A., J. Chem. Soc. **1937,** 1298.
18. Courtot, C., Ann. chim. [9] **4,** 168 **1915.**
19. Dansi, A., Gazz. chim. ital. **68,** 273 **1938.**
20. Daufresne, Bull. soc. chim. [4] **1,** 1233 **1907.**
21. Drake, N. L., and W. P. Campbell, J. Am. Chem. Soc. **58,** 1681 **1936.**
22. Eschinazi, H. E., and F. Bergmann, J. Am. Chem. Soc. **65,** 1411 **1943.**
23. Ferrer, J., Anales soc. españ. fís. quím. **20,** 459 **1922;** C. A. **17,** 3177 **1923;** Chem. Zentr. **1923,** III, 1161.
24. Fichter, F., and H. Stenzl, Helv. Chim. Acta **22,** 425 **1939.**
25. Fichter, F., and H. Stenzl, Roczniki Chem. **18,** 510 **1938;** Chem. Zentr. **1939,** II, 3053.
26. Fieser, L. F., and J. Cason, J. Am. Chem. Soc. **62,** 1293 **1940.**
27. Fieser, L. F., and R. C. Clapp, J. Am. Chem. Soc. **63,** 319 **1941.**
28. Fieser, L. F., M. Fieser, and E. B. Hershberg, J. Am. Chem. Soc. **58,** 1463 **1936.**
29. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **59,** 2502 **1937.**
30. France, H., P. Maitland, and S. H. Tucker, J. Chem. Soc. **1937,** 1739.
31. France, H., S. H. Tucker, and J. Forrest, J. Chem. Soc. **1945,** 7.
32. Freund, M., K. Fleischer, and J. Stemmer, Ann. **414,** 44 **1918.**
33. Hewett, C. L., J. Chem. Soc. **1936,** 596.
34. Koelsch, C. F., J. Am. Chem. Soc. **55,** 3885 **1933.**
35. Krüber, O., Ber. **64,** 84 **1931.**
36. Krüber, O., Ber. **67,** 1000 **1934.**
37. Leuchs, H., and L. Lock, Ber. **48,** 1432 **1915.**
38. Maitland, P., and S. H. Tucker, J. Chem. Soc. **1929,** 2559.
39. Manchot, W., and P. Krische, Ann. **337,** 170 **1904.**
40. Maxim, N., Bull. soc. chim. [4] **43,** 769 **1928.**
41. Maxim, N., Bull. soc. chim. [4] **45,** 1137 **1929.**
42. Mayer, F., Ber. **46,** 2579 **1913.**
43. Miller, H. F., and J. Bachman, J. Am. Chem. Soc. **57,** 766 **1935.**
44. Newman, M. S., J. Am. Chem. Soc. **60,** 2947 **1938.**
45. Pestemer, M., and F. Manchen, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **145,** Abt. IIb, 312 **1936.**
46. Pinkney, P. S., and C. S. Marvel, J. Am. Chem. Soc. **59,** 2669 **1937.**
47. Pokrovskaya, E. S., and T. G. Stepanseva, J. Gen. Chem. (U.S S R.) **9,** 1953 **1939;** C.A. **34,** 4731 **1940.**
48. Pummerer, R , A. Luttringhaus, R. Fick, S. Pfaff, G. Riegelbauer, and E. Rosenhauer, Ber. **71,** 2569 **1938.**
49. Ramage, G. R., J. Chem. Soc. **1938,** 397.
50. Ramage, G. R., and R. Robinson, J. Chem. Soc. **1933,** 607.
51. Ramart-Lucas, and J. Hoch, Bull. soc. chim. [5] **2,** 1376 **1935.**
52. Reilly, J. A., and J. A. Nieuwland, J. Am. Chem. Soc. **50,** 2564 **1928.**
53. Roser, W., Ann. **247,** 129 **1888.**
54. Ruzicka, L., and H. Hösli, Helv. Chim. Acta **17,** 470 **1934.**
55. Schlenk, W., and E. Bergmann, Ann. **463,** 1 **1928.**
56. Schlenk, W., O. Bergmann, and E. Bergmann, J. Soc. Chem. Ind. **52,** 209T **1933.**
57. Schroter, G., Ber. **57,** 1990 **1924.**
58. Schroter, G., Ber. **57,** 2003 **1924.**
59. Sieglitz, A., and H. Jassoy, Ber. **55,** 2032 **1922.**
60. Spilker, A., and W. Schade, Ber. **65,** 1686 **1932.**

61. Stobbe, H., and E. Färber, Ber. **57,** 1838 **1924.**
62. Straus, F., R. Kühnel, and R. Haensel, Ber. **66,** 1847 **1933.**
63. Thiele, J., and J. Meisenheimer, Ann. **306,** 225 **1899.**
64. Ullmann, F., and R. von Wurstemberger, Ber. **38,** 4105 **1905.**
65. Urushibara, Y., T. Ando, H. Araki, and A. Ozawa, Bull. Chem. Soc. Japan **12,** 353 **1937.**
66. Vansheidt, A., and B. Moldavski, Ber. **64,** 917 **1931.**
67. Vansheidt, A., and B. Moldavski, J. Gen. Chem. (U.S.S.R.) **1,** 304 **1931;** Chem. Zentr. **1931,** II, 3208.
68. Veselý, V., and F. Štursa, Chem. Listy **29,** 257 **1935;** Chem. Zentr. **1936,** I, 1221.
69. von Braun, J., and E. Anton, Ber. **62,** 145 **1929.**
70. von Braun, J., and E. Anton, Ber. **67,** 1051 **1934.**
71. von Braun, J., O. Bayer, and L. F. Fieser, Ann. **459,** 287 **1927.**
72. von Braun, J., and G. Kirschbaum, Ber. **54,** 597 **1921.**
73. von Braun, J., and G. Manz, Ann. **488,** 111 **1931.**
74. von Braun, J., and G. Manz, Ber. **63,** 2608 **1930.**
75. Wagner-Jauregg, T., Ann. **491,** 1 **1931.**
76. Weiss, R., and K. Woidich, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **134,** Abt. IIb, 453 **1925.**
77. Wieland, H., and O. Probst, Ann. **530,** 274 **1937.**
78. Wieland, H., F. Reindel, and J. Ferrer, Ber. **55,** 3313 **1922.**
79. Wislicenus, W., and W. Mocker, Ber. **46,** 2772 **1913.**

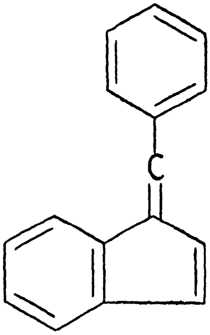
VII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-10}

1. Indene Derivatives of Empirical Formula C_nH_{2n-10}
2. Naphthalene Derivatives of Empirical Formula C_nH_{2n-10}
3. Cyclanoanthracenes and Their Alkyl Derivatives
4. Cyclanophenanthrenes and Their Alkyl Derivatives
5. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-10}

1. INDENE DERIVATIVES OF EMPIRICAL FORMULA C_nH_{2n-20}

$C_{16}H_{12}$

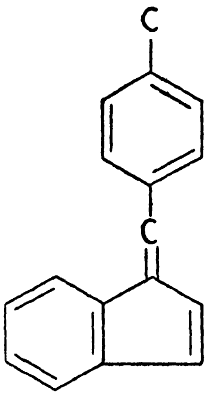
1-Benzylideneindene
(Phenylbenzofulvene)



M. P., °C
88–89[7]
88[2, 4]
87[3]

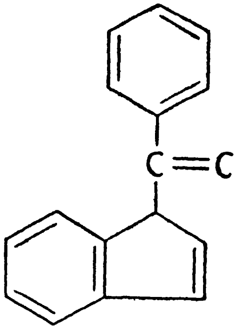
$C_{17}H_{14}$

1-(4′-Methylbenzylidene)-indene



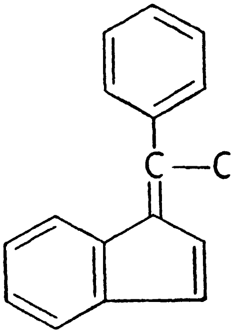
M. P., °C
91–92[1]

1-Phenyl-1-indenylethene



M. P., °C
80[2]

1-Phenyl-1-indenylidene-ethane

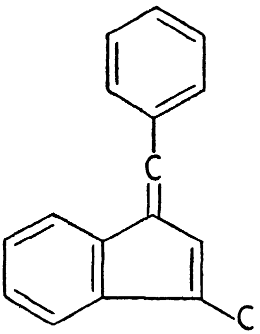


M. P., °C
70[2]
68–69[6]

B. P., °C @ 760mm

204–205	16[6]
178–179	5[6]

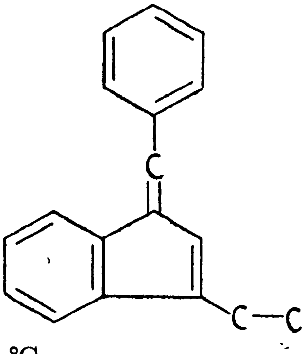
1-Benzylidene-3-methylindene



M. P., °C
43–44[5, 9]

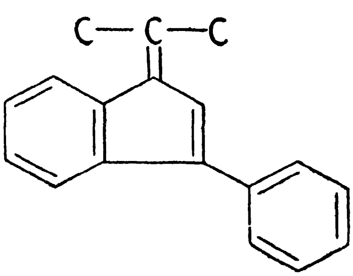
$C_{18}H_{16}$

1-Benzylidene-3-ethylindene



M. P., °C
58[8]

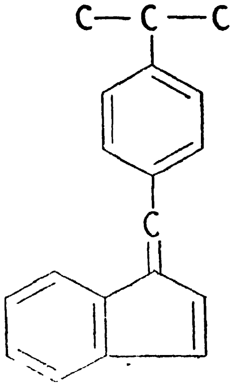
1-Isopropylidene-3-phenylindene



M. P., °C
99.5–100[10]

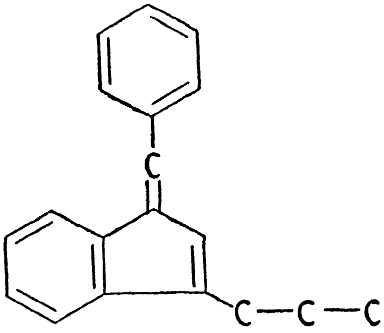
$C_{19}H_{18}$

1-(4′-Isopropylbenzylidene)-indene



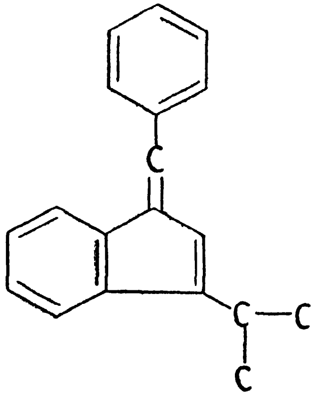
M. P., °C
60–61[1]

1-Benzylidene-3-*n*-propylindene



M. P., °C
132[8]

1-Benzylidene-3-isopropylindene



M. P., °C
101[6]

References on Indene Derivatives of Empirical Formula C_nH_{2n-20}

1. Bernthsen, W., Ann. **415**, 274 **1918**.
2. Courtot, C., Ann. chim. [9] **4**, 168 **1915**.
3. Thiele, J., Ber. **33**, 851 **1900**.
4. Thiele, J., Ber. **33**, 3395 **1900**.
5. Thiele, J., and S. Bühner, Ann. **347**, 249 **1906**.
6. Thiele, J., and K. Merck, Ann. **415**, 257 **1918**.
7. Whitby, G. S., and M. Katz, J. Am. Chem. Soc. **50**, 1160 **1928**.
8. Wislicenus, W., and W. Hentrick, Ann. **436**, 9 **1924**.
9. Wuest, H. M., Ann. **415**, 291 **1918**.
10. Ziegler, K., and F. Crössmann, Ann. **511**, 89 **1934**.

2. NAPHTHALENE DERIVATIVES OF EMPIRICAL FORMULA C_nH_{2n-20}

$C_{16}H_{12}$

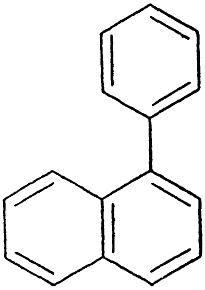
Cyclopentadien-2,4-ylidene-(x'-naphthyl)-methane (a)

M. P., °C

87–88[16]

(a) The structure of this compound was not clearly defined in the literature.

1-Phenylnaphthalene



M. P., °C

84–86[6]

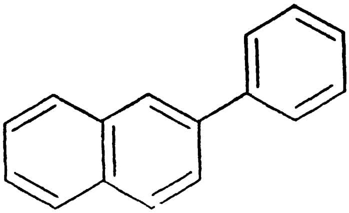
B. P., °C @ 750mm

336–337[29]	
324–326[59]	
324–325[31]	
334	770[61]
194	18[29]
192–195	16–17[51]
190	12[42]
189–190	12[60]
187–189	12[56]
186–188	10[52]
134–135	2[60]

D_4^{20}

1.103[56]

2-Phenylnaphthalene



M. P., °C

102
104–105[1]
104[27]
103–104[10]
103[23]
102.2–102.7[18]
102–102.5[2]
101.5–102[4]
101–102 (a)
101.5[11, 32]
101–101.5[9]
101[49]
98.5–100[13]
98–99[19]
97–98[85]

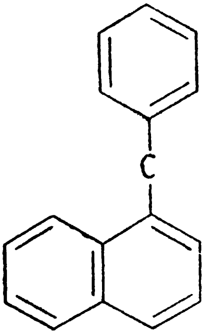
B. P., °C @ 760mm

357–358[23]
346–347[54]
345–346[9, 11]

(a) The melting point 101–102 is found in references 7, 22, 31, 45, 46, 47, 50, 54, 55, 57.

$C_{17}H_{14}$

1-Benzylnaphthalene



M. P., °C
58.6
59 (a)
59 (b)^{58}
58–59^{43}
58.5^{17}
58^{33}
57.5–58^{8}
57–58^{41}

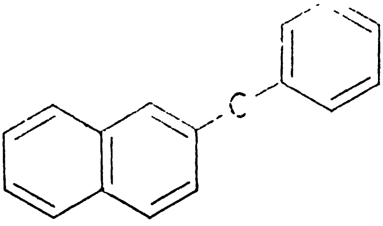
B. P., °C @ 760mm
350^{58}
200–205 9^{37}

D_4^{20}
1.165 0° $^{38, 53}$

(a) The melting point 59 is found in references 3, 14, 21, 25, 38, 44, 53.

(b) This constant was given as a freezing point in the literature.

2-Benzylnaphthalene



M. P., °C
58^{8}
57^{3}
55.5^{16}
55–55.5^{53}
39–40^{41}
35.5^{38}

D_4^{20}
1.176 0° $^{38, 53}$

---

x-Benzylnaphthalene (a)

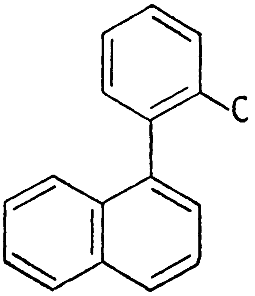
M. P., °C
64^{20}
58.6^{30}
58^{28}

B. P., °C @ 760mm
168.5–169 1.5^{24}

D_4^{20}
1.0777^{24}
1.166 17° ^{30}

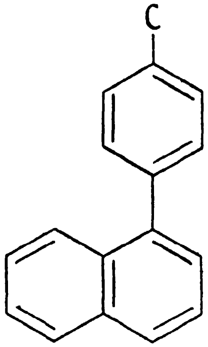
(a) The structure of this compound was not clearly defined in the literature.

1-*o*-Tolylnaphthalene



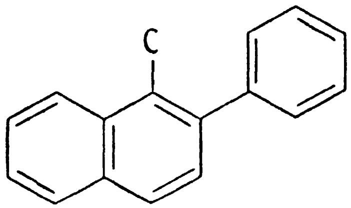
M. P., °C
67.5–68.5^{13}
63^{26}

1-*p*-Tolylnaphthalene



B. P., °C @ 760mm
148-150 0.15[5]

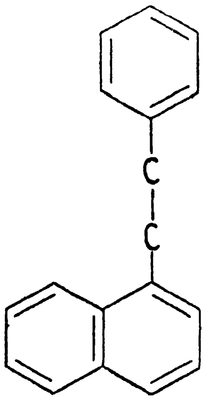
1-Methyl-2-phenylnaphthalene



M. P., °C
84[49]

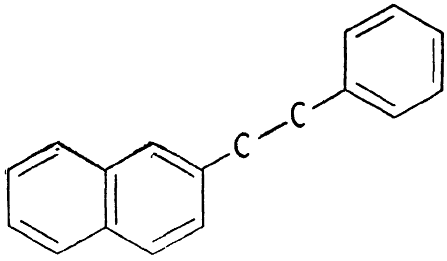
$C_{18}H_{16}$

1-Phenethylnaphthalene



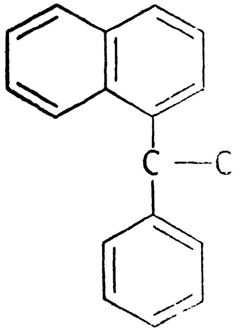
B. P., °C @ 760mm
175 5[12]

2-Phenethylnaphthalene



M. P., °C
99-100[12]

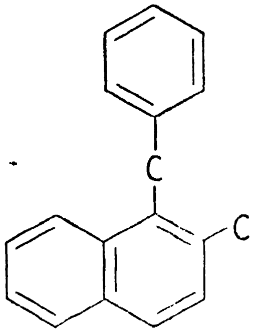
1-Phenyl-1-(1′-naphthyl)-ethane



M. P., °C
69[48]

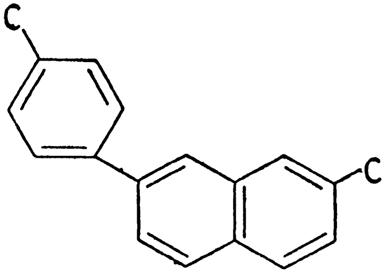
B. P., °C @ 760mm
220-222 15[48]

1-Benzyl-2-methylnaphthalene



B. P., °C @ 760mm
221-222 17[15]

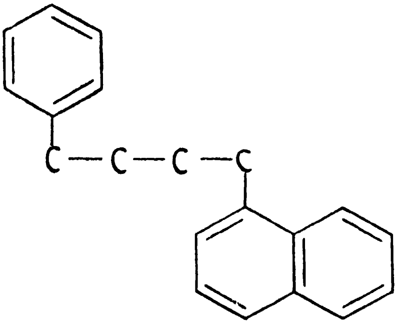
2-Methyl-7-*p*-tolylnaphthalene



M. P., °C
140–141[55]

$C_{20}H_{20}$

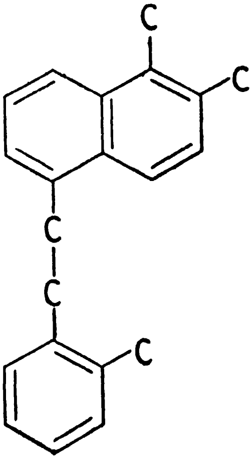
1-Phenyl-4-(1′-naphthyl)-butane



M. P., °C
80.5–82[40]

$C_{21}H_{22}$

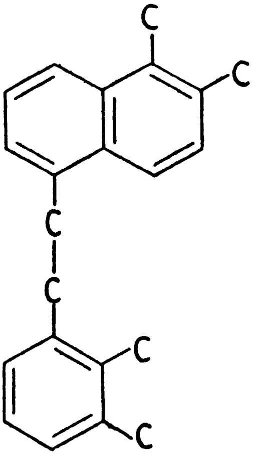
1,2-Dimethyl-5-(2′-methylphenethyl)-naphthalene



M. P., °C
60[39]

$C_{22}H_{24}$

1,2-Dimethyl-5-(2′,3′-dimethylphenethyl)-naphthalene



M. P., °C
90.5–91.5[39]

$C_{31}H_{42}$

1-Methyl-x_4-tetracyclopentylnaphthalene (a)

M. P., °C
97[34]

(a) The structure of this compound was not clearly defined in the literature.

$C_{34}H_{48}$

x_4-Tetracyclohexylnaphthalene (a)

M. P., °C
269[35]

(a) The structure of this compound was not clearly defined in the literature.

References on Naphthalene Derivatives of Empirical Formula C_nH_{2n-20}

1. Bamberger, E., and C. Burgdorf, Ber. **23, 2433 1890.**

2. Bamberger, E., and F. Chattaway, Ber. **26,** 1745 **1893.**

3. Barrett, J. W., and R. P. Linstead, J. Chem. Soc. **1936,** 611.

4. Baumgarten, P., and J. Olshausen, Ber. **64,** 925 **1931.**

5. Bergmann, F., and A. Weizmann, J. Org. Chem. **9,** 352 **1944.**

6. Blicke, F. F., and L. D. Powers, J. Am. Chem. Soc. **51,** 3378 **1929.**

7. Bodroux, D., Ann. chim. [10] **11,** 511 **1929.**

8. Borsche, W., P. Hofmann, and H. Kühn, Ann. **554,** 23 **1943.**

9. Breuer, A., and T. Zincke, Ber. **11,** 1403 **1878.**

10. Carter, H. E., and E. J. Van Loon, J. Am. Chem. Soc. **60,** 1077 **1938.**

11. Chattaway, F. D , and W. H. Lewis, J. Chem. Soc. **65,** 869 **1894.**

12. Cook, J. W., and C. L. Hewett, J. Chem. Soc. **1934,** 365.

13. Cook, J. W., and C. A. Lawrence, J. Chem. Soc. **1936,** 1431.

14 Dziewoński, K., and S. Dziecielewski, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1927A,** 273.

15. Dziewoński, K., and E. Ritt, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1927A,** 181.

16. Dziewoński, K., and S. Wodelski, Roczniki Chem. **12,** 366 **1932;** C. A. **27,** 2145 **1933.**

17. Elbs, K., J. prakt. Chem. [2] **35,** 465 **1887.**

18. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **60,** 940 **1938.**

19. Fittig, Ber. **5,** 806 **1872.**

20. Froté, C., Jahresber. **27,** 390 **1873.**

21. Gasopoulos, I., Praktika Akad. Athenon **7,** 47 **1932;** C. A. **28,** 1672 **1934;** Chem. Zentr. **1933,** II, 43.

22. Hey, D. H., and S. E. Lawton, J. Chem. Soc. **1940,** 374.

23. Kruber, O., and A. Marx, Ber. **71,** 2478 **1938.**

24. Larsen, R. G., R. E. Thorpe, and F. A. Armfield, Ind. Eng. Chem. **34,** 183 **1942.**

25. Lorriman, F. R., J. Am. Chem. Soc. **47,** 211 **1925.**

26. Mayer, F., and R. Schiffner, Ber. **65,** 1337 **1932.**

27. Mayer, F., and R. Schiffner, Ber. **67,** 67 **1934.**

28. McKenzie, A., and W. S. Dennler, J. Chem. Soc. **125,** 2105 **1924.**

29. Michael, A., and J. E. Bucher, Am. Chem. J. **20,** 89 **1898.**

30. Miguel, P., Bull. soc. chim. [2] **26,** 2 **1876.**

31. Möhlau, R., and R. Berger, Ber. **26,** 1196 **1893.**

32. Möhlau, R., and R. Berger, Ber. **26,** 1994 **1893.**

33. Nenitzescu, C. D., D. A. Isăcescu, and C. D. Ionescu, Ann. **491,** 210 **1931.**

34. Pokrovskaya, E. S., J. Gen. Chem. (U.S.S.R.) **13,** 579 **1943;** Survey For. Petrol. Liter. T472B Oct. 20, **1944.**

35. Pokrovskaya, E. S., and T. G. Stepanzeva, J. Gen. Chem. (U.S.S.R.) **9,** 1953 **1939;** C. A. **34,** 4731 **1940.**

36. Postovskiĭ, I., N. Apollov, and B. Lugovkin, Ann. inst. polytech. Oural **6,** 241 **1927;** C.A. **22,** 4787 **1928.**

37. Price, C. C., and J. M. Ciskowski, J. Am. Chem. Soc. **60,** 2499 **1938.**

38. Roux, L., Ann. chim. phys. [6] **12,** 289 **1887.**

39. Ruzicka, L., A. Grob, and G. Anner, Helv. Chim. Acta **26,** 254 **1943.**

40. Schroeter, G., Ber. **57,** 1990 **1924.**

41. Sharma, V. N., and S. Dutt, J. Indian Chem. Soc. **12,** 774 **1935.**

42. Sherwood, I. R., W. F. Short, and R. Stansfield, J. Chem. Soc. **1932,** 1832.

43. Shima, G., Mem. Coll. Sci., Kyoto Imp. Univ. **13A,** 315 **1930.**

44. Skraup, S., and K. Böhm, Ber. **59,** 1007 **1926.**

45. Smith, W., Ber. **12,** 1396 **1879.**

46. Smith, W., and T. Takamatsu, J. Chem. Soc. **39,** 546 **1881.**

47. Späth, E., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **121,** Abt. IIb, 683 **1912.**

48. Spilker, A., and W. Schade, Ber. **65,** 1686 **1932.**

49. Spring, F. S., J. Chem. Soc. **1934,** 1332.

50. Stoermer, R., and O. Kippe, Ber. **36,** 3992 **1903.**

51. Straus, F., Ann. **342,** 190 **1905.**

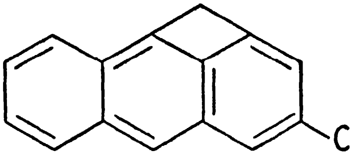
52. Veselý, V., and F. Štursa, Collection Czechoslov. Chem. Commun. **5,** 343 **1933.**

53. Vincent, C., and L. Roux, Bull. soc. chim. [2] **40**, 163 **1883**.
54. Volhard, J., Ann. **296**, 1 **1897**.
55. von Auwers, K., and G. Keil, Ber. **36**, 3902 **1903**.
56. von Braun, J., and E. Anton, Ber. **67**, 1051 **1934**.
57. von Braun, J., and G. Manz, Ann. **468**, 258 **1929**.
58. von Meyer, E., J. prakt. Chem. [2] **82**, 538 **1910**.
59. Wagner-Jauregg, T., Ann. **491**, 1 **1931**.
60. Weiss, R., Org. Syntheses **24**, 84 **1944**.
61. Weiss, R., and K. Woidich, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **134**, Abt. IIb, 453 **1925**.

3. CYCLANOANTHRACENES AND THEIR ALKYL DERIVATIVES, C_nH_{2n-20}

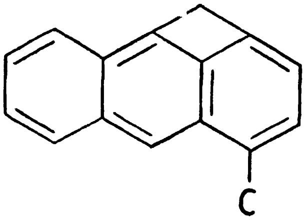
$C_{16}H_{12}$

Cyclobutano-[mn]-3-methylanthracene



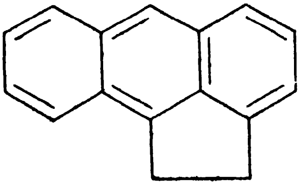
M. P., °C
85[2, 4]

Cyclobutano-[mn]-4-methylanthracene



M. P., °C
63[2]

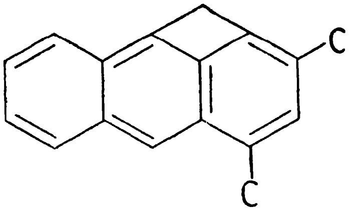
Cyclopentano-[de]-anthracene
(Aceanthrene)



M. P., °C
113[9]

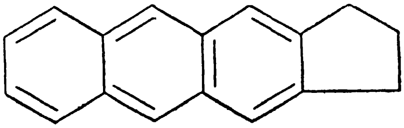
$C_{17}H_{14}$

Cyclobutano-[mn]-2,4-dimethylanthracene



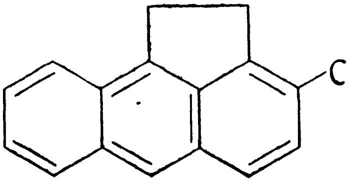
M. P., °C
64[3]

2,3-Cyclopentanoanthracene



M. P., °C
242–243[10]

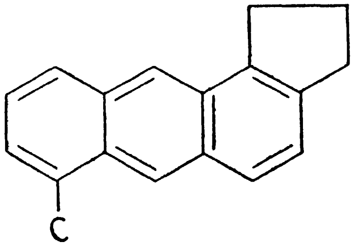
Cyclopentano-[mn]-2-methylanthracene



M. P., °C
122[1]

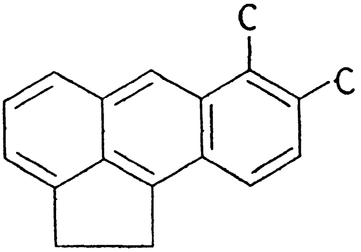
$C_{18}H_{16}$

1,2-Cyclopentano-5-methylanthracene



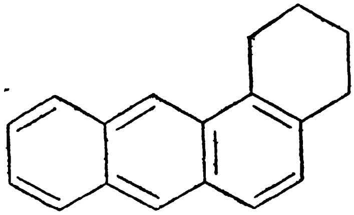
M. P., °C
131–132[5]

Cyclopentano-[fg]-1,2-dimethylanthracene



M. P., °C
206–207[5]

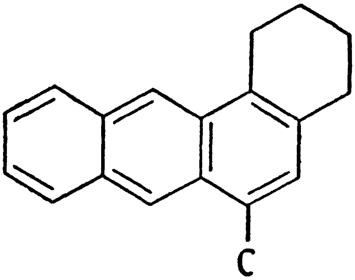
1,2-Cyclohexanoanthracene



M. P., °C
104.5–105[7]

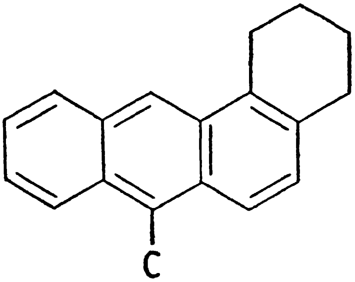
$C_{19}H_{18}$

1,2-Cyclohexano-4-methylanthracene



M. P., °C
82.3–82.9[8]

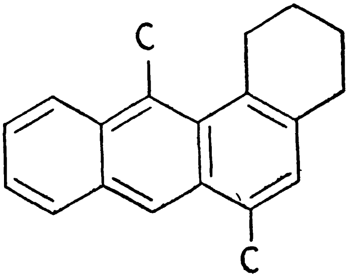
1,2-Cyclohexano-10-methylanthracene



M. P., °C
117.3–117.8[7]

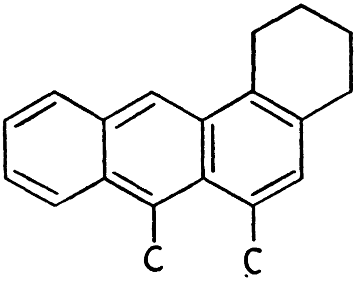
$C_{20}H_{20}$

1,2-Cyclohexano-4,9-dimethylanthracene



M. P., °C
62.4–62.8[8]

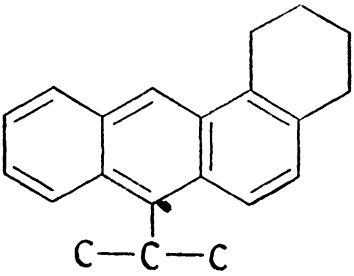
1,2-Cyclohexano-4,10-dimethylanthracene



M. P., °C
105–105.5[8]

$C_{21}H_{22}$

1,2-Cyclohexano-10-isopropylanthracene



M. P., °C
81.9–82.5[6]

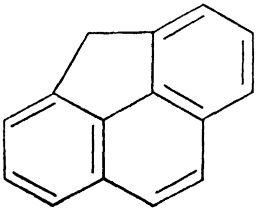
References on Cyclanoanthracenes and Their Alkyl Derivatives

1. Dansi, A., and A. Sempronj, Gazz. chim. ital. **66,** 182 **1936.**
2. Elbs, K., J. prakt. Chem. [2] **41,** 1 **1890.**
3. Elbs, K., J. prakt. Chem. [2] **41,** 121 **1890.**
4. Elbs, K., and M. Günther, Ber. **20,** 1364 **1887.**
5. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **59,** 394 **1937.**
6. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **59,** 2331 **1937.**
7. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **59,** 2502 **1937.**
8. Fieser, L. F., and R. N. Jones, J. Am. Chem. Soc. **60,** 1940 **1938.**
9. Fieser, L. F., and M. A. Peters, J. Am. Chem. Soc. **54,** 4373 **1932.**
10. von Braun, J., G. Kirschbaum, and H. Schumann, Ber. **53,** 1155 **1920.**

4. CYCLANOPHENANTHRENES AND THEIR ALKYL DERIVATIVES, C_nH_{2n-20}

$C_{15}H_{10}$

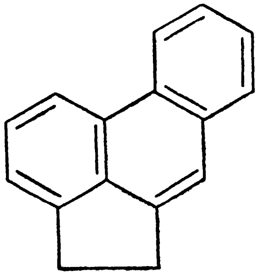
Cyclopentano-[def]-phenanthrene



M. P., °C
116[35]
114.6–115.3[18]
114.0–115.0[7]
B. P., °C @ 760mm
353[35]

$C_{16}H_{12}$

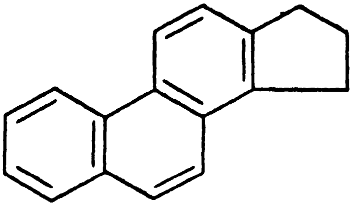
Cyclopentano-[jk]-phenanthrene



M. P., °C
106[25]

$C_{17}H_{14}$

1,2-Cyclopentanophenanthrene



M. P., °C

135

137–138[21]

135–136[6, 33]

134.4–135.8[38]

135[8, 28, 32]

134.5–135[17]

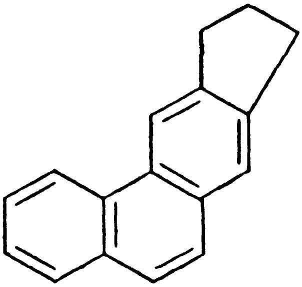
134–135[40]

133–134[15, 40]

132–133[5]

130–131[5]

2,3-Cyclopentanophenanthrene



M. P., °C

85

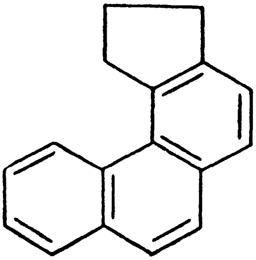
85–85.5[11, 36]

84–84.5[15]

83.5–84.5[5]

84[41]

3,4-Cyclopentanophenanthrene



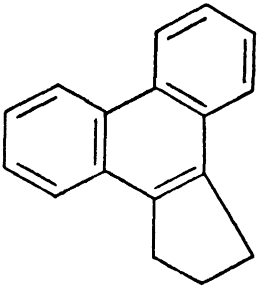
M. P., °C

73.5–75 (a)[5]

71.5–72[6]

(a) This compound remelts at 60.

9,10-Cyclopentanophenanthrene



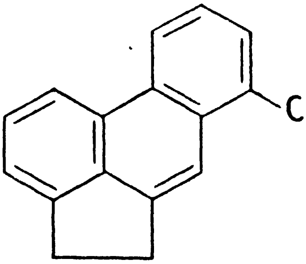
M. P. °C

154[44, 45]

150–151[14]

149–150[5]

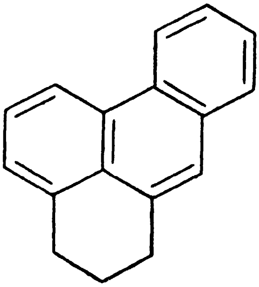
Cyclopentano-[jk]-1-methylphenanthrene



M. P., °C

159[25]

Cyclohexano-[jk]-phenanthrene

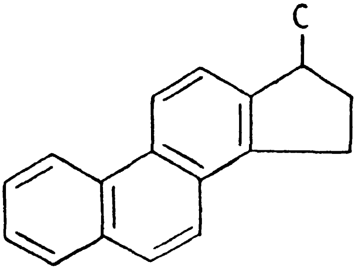


M. P., °C
$81\text{–}82^{16}$
$76\text{–}77^{5}$

$C_{18}H_{16}$

1,2-(3′-Methylcyclopentano)-phenanthrene

(Diels' Hydrocarbon)

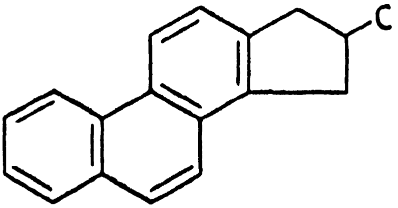


M. P., °C
126
$128\text{–}129\ (a)^{19}$
$126.5\text{–}127^{31}$
$126\text{–}127^{12,\ 30,\ \text{[illegible]}8}$
126^{37}
$125\text{–}126^{22,\ 27,\ 29,\ 43}$
$125\ (a)^{20}$
$124\text{–}125^{10,\ 42}$
$123\text{–}124^{39}$

B. P., °C @ 760mm
162–165 0.1^{29}

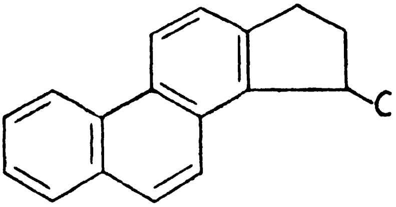
(a) Diels assigned the structure of 1,2- (cyclopenten-3′-o) -7,8- (3″-ethylcyclopenten-3″-o) - naphthalene to this compound, but it was later proved to be the above compound.

1,2-(4′-Methylcyclopentano)-phenanthrene



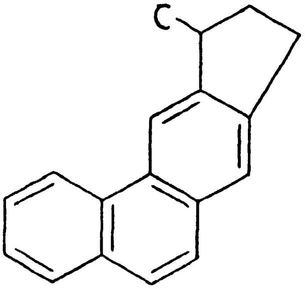
M. P., °C
$106.5\text{–}107^{40}$

1,2-(5′-Methylcyclopentano)-phenanthrene



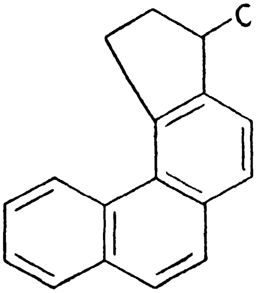
M. P., °C
$76\text{–}77^{40}$

2,3-(3′-Methylcyclopentano)-phenanthrene



M. P., °C
$75\text{–}76^{30}$

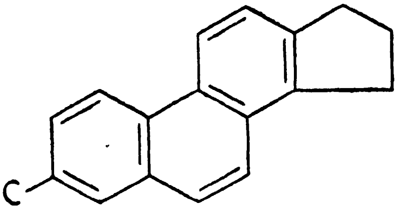
3,4-(5′-Methylcyclopentano)-phenanthrene



M. P., °C
$28\text{–}29^{30}$

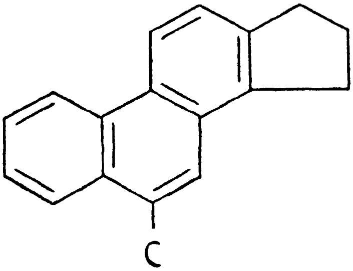
B. P., °C @ 760mm
172–173 0.05^{30}

1,2-Cyclopentano-7-methylphenanthrene



M. P., °C
132[34]

1,2-Cyclopentano-9-methylphenanthrene



M. P., °C
109–110[26]

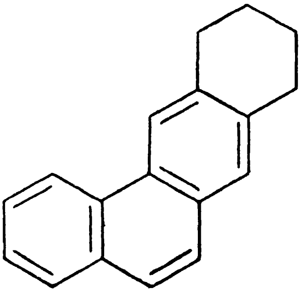
---

x,x-Cyclopentano-x-methylphenanthrene (a)

M. P., °C
147[9]

(a) The structure of this compound was not clearly defined in the literature.

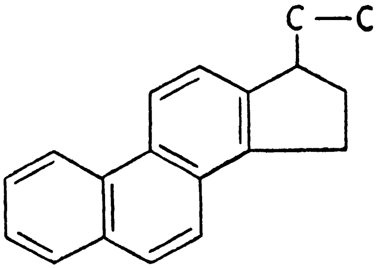
2,3-Cyclohexanophenanthrene



M. P., °C
88.5–89.5[24]

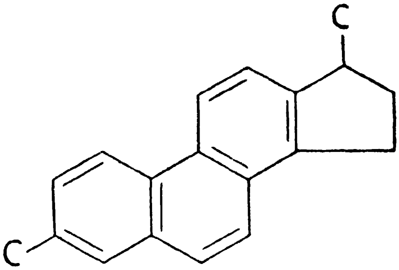
$C_{19}H_{18}$

1,2-(3′-Ethylcyclopentano)-phenanthrene



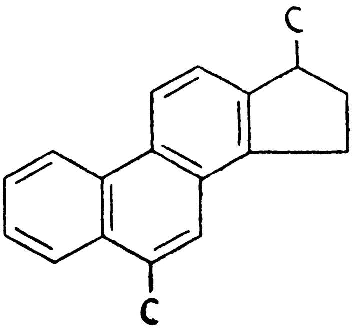
M. P., °C
85–86[38]

1,2-(3′-Methylcyclopentano)-7-methylphenanthrene



M. P., °C
139–140[34]

1,2-(3′-Methylcyclopentano)-9-methylphenanthrene



M. P., °C
80[26]

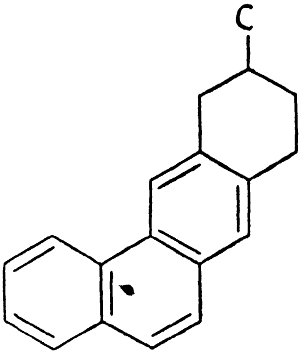
---

x,x-Dimethyl-x,x-cyclopentanophenanthrene (a)

M. P., °C
165[23]

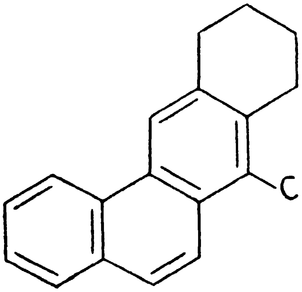
(a) The structure of this compound was not clearly defined in the literature.

2,3-(4′-Methylcyclohexano)-phenanthrene



M. P., °C
114–115.5[4]

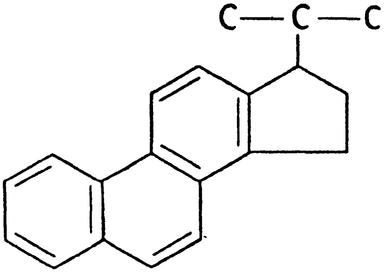
2,3-Cyclohexano-1-methylphenanthrene



M. P., °C
73.7–74.5[18]
73.9–74.4[24]

$C_{20}H_{20}$

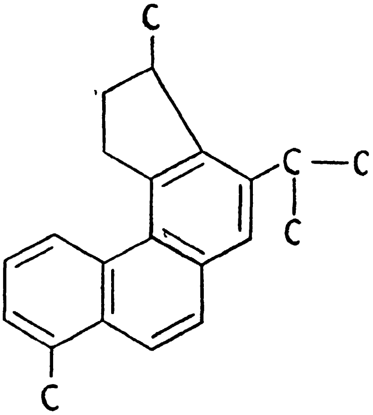
1,2-(3′-Isopropylcyclopentano)-phenanthrene



M. P., °C
97.6–98.4[38]
96[13]

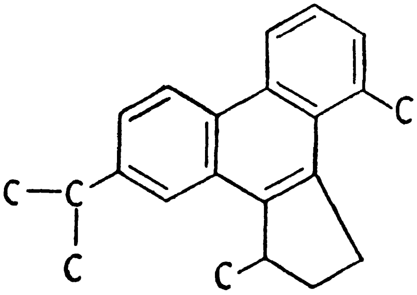
$C_{22}H_{24}$

3,4-(5′-Methylcyclopentano)-2-isopropyl-8-methylphenanthrene



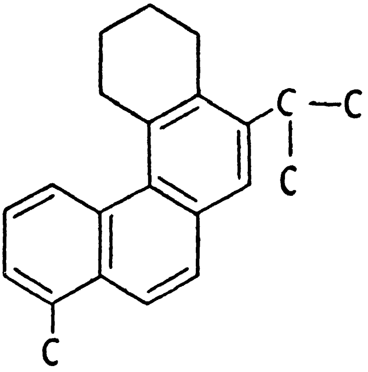
M. P., °C
74.5–75.5[3]

9,10-(5′-Methylcyclopentano)-1-methyl-7-isopropylphenanthrene



M. P., °C
74.5–75.5[1]

3,4-Cyclohexano-2-isopropyl-8-methylphenanthrene



M. P., °C
88–89[2]

References on Cyclanophenanthrenes and Their Alkyl Derivatives

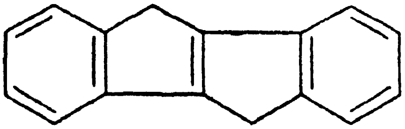
1. Adelson, D. E., and M. T. Bogert, J. Am. Chem. Soc. **59,** 399 **1937.**
2. Adelson, D. E., and M. T. Bogert, J. Am. Chem. Soc. **59,** 1776 **1937.**
3. Adelson, D. E., and M. T. Bogert, Proc. Nat. Acad. Sci. U. S. **23,** 117 **1937.**
4. Bachmann, W. E., and J. M. Chemerda, J. Org. Chem. **6,** 36 **1941.**
5. Bachmann, W. E., and M. C. Kloetzel, J. Am. Chem. Soc. **59,** 2207 **1937.**
6. Bachmann, W. E., and M. C. Kloetzel, J. Am. Chem. Soc. **60,** 2204 **1938.**
7. Bachmann, W. E., and J. C. Sheenan, J. Am. Chem. Soc. **63,** 204 **1941.**
8. Bardhan, J. C., J. Chem. Soc. **1936,** 1848.
9. Barger, G., and H. L. Fraenkel-Conrat, J. Chem. Soc. **1936,** 1537.
10. Bergmann, E., and F. Bergmann, J. Chem. Soc. **1939,** 1019.
11. Bergmann, E., and O. Blum-Bergmann, J. Am. Chem. Soc. **59,** 1572 **1937.**
12. Bergmann, E., and H. Hillemann, Ber. **66,** 1302 **1933.**
13. Birch, A. J., and R. Robinson, J. Chem. Soc. **1944,** 503.
14. Bradsher, C. K., J. Am. Chem. Soc. **61,** 3131 **1939.**
15. Burger, A., and E. Mosettig, J. Am. Chem. Soc. **59,** 1302 **1937.**
16. Clar, E., and F. Furnari, Ber. **65,** 1420 **1932.**
17. Cook, J. W., and C. L. Hewett, J. Chem. Soc. **1933,** 1098.
18. Davis, W. W., M. E. Krahl, and G. H. A. Clowes, J. Am. Chem. Soc. **62,** 3080 **1940.**
19. Diels, O., W. Gädke, and P. Körding, Ann. **459,** 1 **1927.**
20. Diels, O., and A. Karstens, Ann. **478,** 129 **1930.**
21. Diels, O., and H. Klare, Ber. **67,** 113 **1934.**
22. Elderfield, R. C., and W. A. Jacobs, J. Biol. Chem. **107,** 143 **1934.**
23. Farmer, S. N., and G. A. R. Kon, J. Chem. Soc. **1937,** 414.
24. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **59,** 2502 **1937.**
25. Fieser, L. F., and M. A. Peters, J. Am. Chem. Soc. **54,** 4373 **1932.**
26. Gamble, D. J. C., and G. A. R. Kon, J. Chem. Soc. **1935,** 443.
27. Gamble, D. J. C., G. A. R. Kon, and B. Saunders, J. Chem. Soc. **1935,** 644.
28. Hawthorne, J. R., and R. Robinson, J. Chem. Soc. **1936,** 763.
29. Hillemann, H., Ber. **68,** 102 **1935.**
30. Hillemann, H., Ber. **69,** 2610 **1936.**
31. Kägi, H., and K. Miescher, Helv. Chim. Acta **22,** 1683 **1939.**
32. Koebner, A., and R. Robinson, J. Chem. Soc. **1938,** 1994.
33. Kon, G. A. R., J. Chem. Soc. **1933,** 1081.
34. Kon, G. A. R., and A. M. Woolman, J. Chem. Soc. **1939,** 794.
35. Krüber, O., Ber. **67,** 1000 **1934.**
36. Mohler, H., and J. Sorge, Helv. Chim. Acta **22,** 229 **1939.**
37. Müller, M., Z. physiol. Chem. **233,** 223 **1935.**
38. Riegel, B., M. H. Gold, and M. A. Kubico, J. Am. Chem. Soc. **65,** 1772 **1943.**
39. Rochelmeyer, H., Arch. Pharm. **274,** 543 **1936.**

40. Ruzicka, L., L. Ehmann, M. W. Goldberg, and H. Hösli, Helv. Chim. Acta **16**, 833 **1933**.
41. Sen-Gupta, Science and Culture **3**, 56 **1937**; C.A. **31**, 7868 **1937**; Chem. Zentr. **1938**, I, 4621.
42. Tschesche, R., and H. Knick, Z. physiol. Chem. **222**, 58 **1933**.
43. Tschesche, R., and H. A. Offe, Ber. **68**, 1998 **1935**.
44. Weizmann, C., and E. Bergmann, Scripta Academica Hierosolymitana (Jerusalem) Sci. Report #1, **1938**.
45. Weizmann, C., E. Bergmann, and T. Berlin, J. Am. Chem. Soc. **60**, 1331 **1938**.

5. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-20}

$C_{16}H_{12}$

2,3,6,7-Dibenzobicyclo-[3,3,0]-octene-1,5
(Diphensuccindene-10)



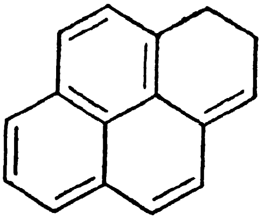
M. P., °C
210[10, 11]

---

x,x-Dihydrobenzo-[jk]-fluorene (a)
M. P., °C
76[25]

(a) The structure of this compound was not clearly defined in the literature.

1,2-Dihydropyrene



M. P., °C
132[14]

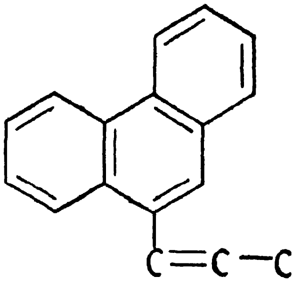
---

x,x-Dihydropyrene (a)
M. P., °C
106[29]

(a) The structure of this compound was not clearly defined in the literature.

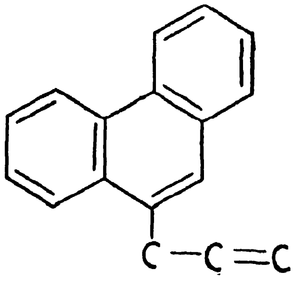
$C_{17}H_{14}$

9-(Propen-1′-yl)-phenanthrene



B. P., °C @ 760mm
179 2.5[6]
n_D^{20}
1.6928 27.5° [6]

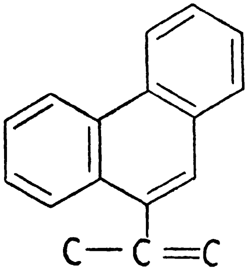
9-(Propen-2′-yl)-phenanthrene



M. P., °C
51[6]

B. P., °C @ 760mm
161–163 1.25[6]
n_D^{20}
1.6280[6]

9-Isopropenylphenanthrene



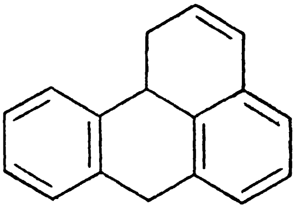
M. P., °C
38[6]
B. P., °C @ 760mm
163 20[6]
n_D^{20}
1.6765[6]

x,x-Dihydrobenzo-[lm]-2-methylfluorene (a)

M. P., °C
127–128[39]

(a) The structure of this compound was not clearly defined in the literature.

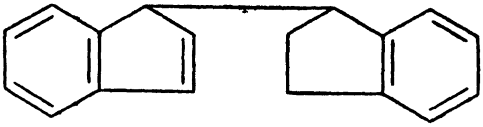
8,9-Benzo-7,9a-dihydrophenalene



M. P., °C
81[5]
79–80[34]

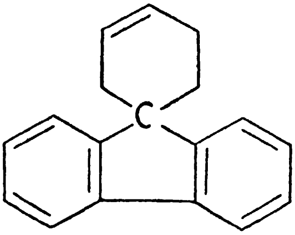
$C_{18}H_{16}$

1-(1′-Indanyl)-indene



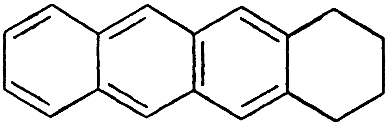
B. P., °C @ 760mm
190–192 12[8]

Spiro[fluorene-9,1′-cyclohexene-3′]



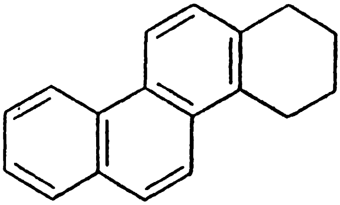
M. P., °C
145.5[41]

1,2,3,4-Tetrahydronaphthacene



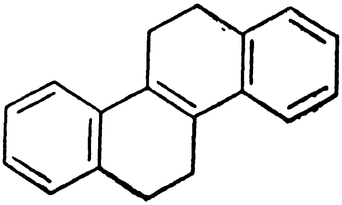
M. P., °C
233[38]

1,2,3,4-Tetrahydrochrysene



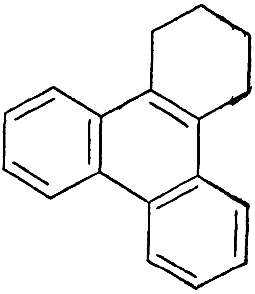
M. P., °C
180.5–181.5[2]

5,6,11,12-Tetrahydrochrysene



M. P., °C
105[33]

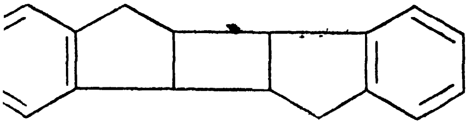
1,2,3,4-Tetrahydrotriphenylene



M. P., °C
122–123[9]
120–121[7]

1,2,3,4-Di-(3′,2′-indano)-cyclobutane

(Truxane)



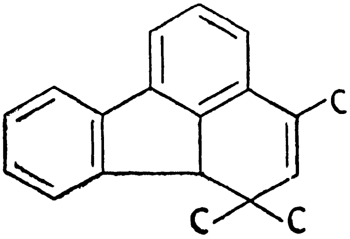
M. P., °C
116[30, 37]

B. P., °C @ 760mm

205	20[37]
206–207	13[30]

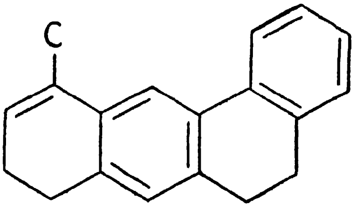
$C_{19}H_{18}$

Benzo-[lm]-2,4,4-trimethyl-4,4a-dihydrofluorene



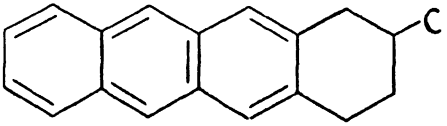
M. P., °C
77–79[22]

1,2-Benzo-8-methyl-3,4,5,6-tetrahydroanthracene



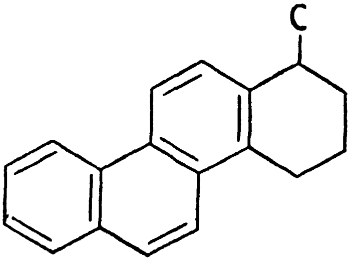
M. P., °C
70–70.5[19]

2-Methyl-1,2,3,4-tetrahydronaphthacene



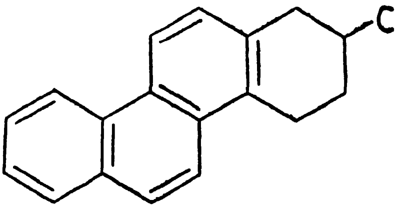
M. P., °C
203[13]

1-Methyl-1,2,3,4-tetrahydrochrysene



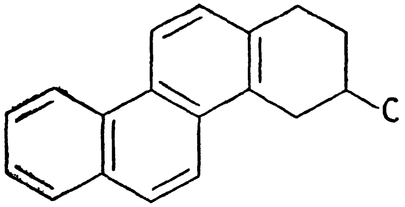
M. P., °C
120.5–121[3]

2-Methyl-1,2,3,4-tetrahydrochrysene



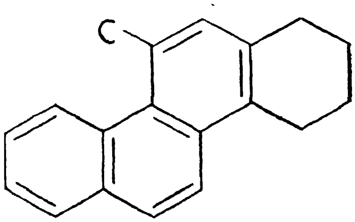
M. P., °C
141.5–142[2]

3-Methyl-1,2,3,4-tetrahydrochrysene



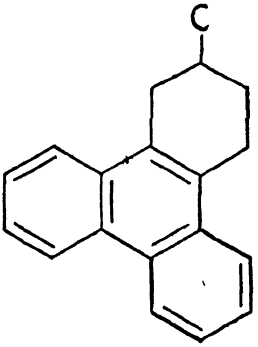
M. P., °C
130–131[3]

11-Methyl-1,2,3,4-tetrahydrochrysene



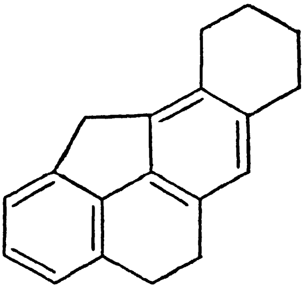
M. P., °C
71–72[1]

2-Methyl-1,2,3,4-tetrahydrotriphenylene



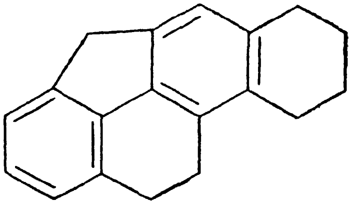
M. P., °C
116.2–116.8[21]

Cyclohexano-[b]-cyclopentano-[def]-9,10-dihydrophenanthrene



M. P., °C
83–83.5[15]

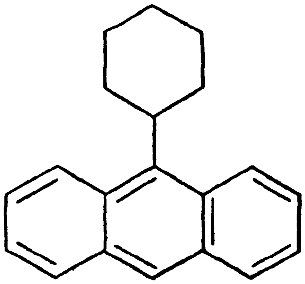
Cyclopentano-[mno]-1,2,3,4,5,6-hexahydrochrysene



M. P., °C
116.6–117.2[15]

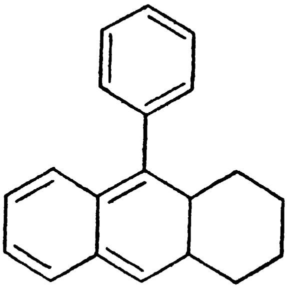
$C_{20}H_{20}$

9-Cyclohexylanthracene



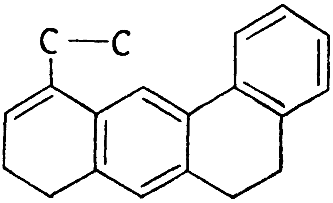
M. P., °C
135–136[42, 43]

9-Phenyl-1,2,3,4,4a,9a-hexahydroanthracene



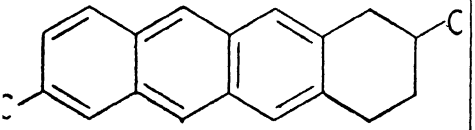
B. P., °C @ 760mm
235 1.5[23]

1,2-Benzo-8-ethyl-3,4,5,6-tetrahydroanthracene



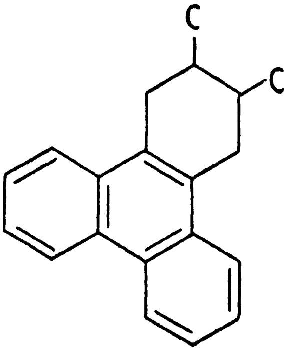
M. P., °C
65–67[20]

2,8-Dimethyl-1,2,3,4-tetrahydronaphthacene



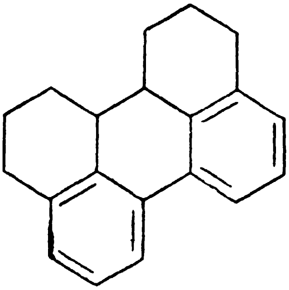
M. P., °C
214[13]

2,3-Dimethyl-1,2,3,4-tetrahydrotriphenylene



M. P., °C
158–160[16]

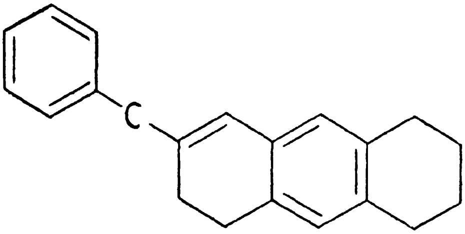
1,2,3,10,11,12,12a,12b-Octahydroperylene



M. P., °C
159–161[45]
119–120[44]

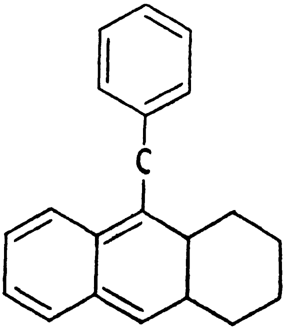
$C_{21}H_{22}$

7-Benzyl-1,2,3,4,5,6-hexahydroanthracene



B. P., °C @ 760mm
255–258 13[35]

9-Benzyl-1,2,3,4,4a,9a-hexahydroanthracene



B. P., °C @ 760mm
255–258 20[23, 24]

1-Methyl-7-isopropyl-x-isopropenylphenanthrene (a)

M. P., °C
64.5–65.5[28]

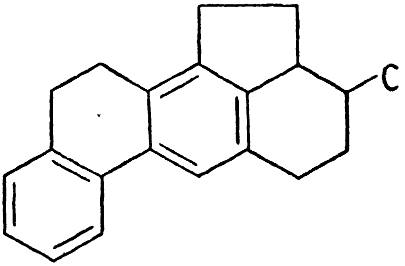
(a) The structure of this compound was not clearly defined in the literature.

10-Isopropyl-x_4-tetrahydro-1,2-benzoanthracene (a)

M. P., °C
72.5–73.5[17]

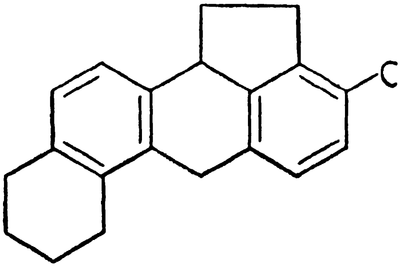
(a) The structure of this compound was not clearly defined in the literature.

3-Methyl-2a,3,4,5,11,12-hexahydrocholanthrene



M. P., °C
157[40]
156–157[36]

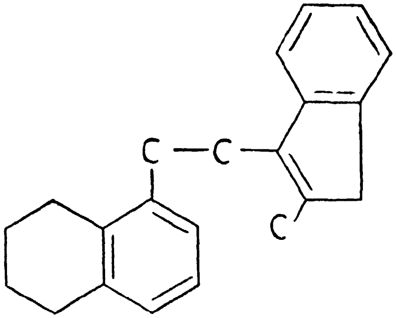
3-Methyl-6,7,8,9,10,12b-hexahydrocholanthrene



M. P., °C
160–160.5[18]

$C_{22}H_{24}$

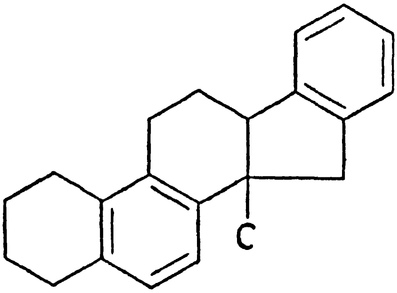
1-(5′,6′,7′,8′-Tetrahydronaphthyl)-2-[3″-(2″-methylindenyl)]-ethane



M. P., °C
73[12]

B. P., °C @ 760mm
190 0.3[12]

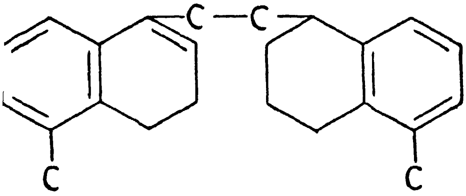
1-Methyl-1,2-(2′,3′-indano)-1,2,3,4,5,6,7,8-octahydrophenanthrene



M. P., °C
123.5–124[12]

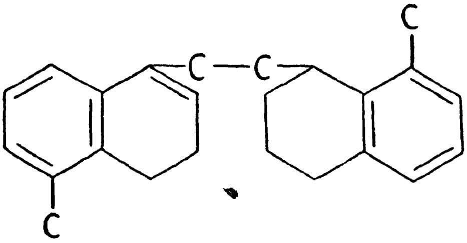
$C_{24}H_{28}$

1-[1′-(5′-Methyl-3,4-dihydronaphthyl)]-2-[1″-(5″-methyl-1″,2″,3″,4″-tetrahydronaphthyl)]-ethane



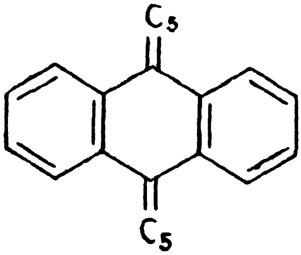
B. P., °C @ 760mm
176–178 0.1[32]

1-[1′-(5′-Methyl-3′,4′-dihydronaphthyl)]-2-[1″-(8″-methyl-1″,2″,3″,4″-tetrahydronaphthyl)]-ethane



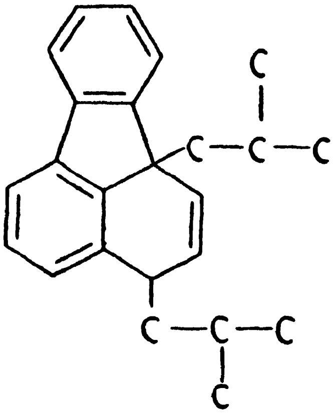
B. P., °C @ 760mm
185–186 0.1[31]

9,10-Dipentylidene-9,10-dihydroanthracene



M. P., °C
103–108[26]

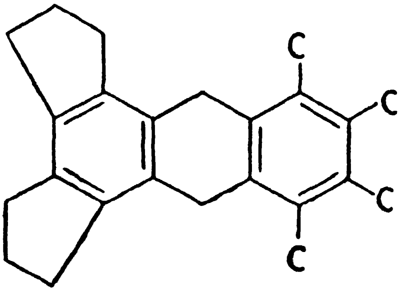
1,2-Benzo-2a,5-diisobutyl-2a,5-dihydroacenaphthylene (a)



M. P., °C
160[27]

(a) The structure of this compound was not clearly defined in the literature.

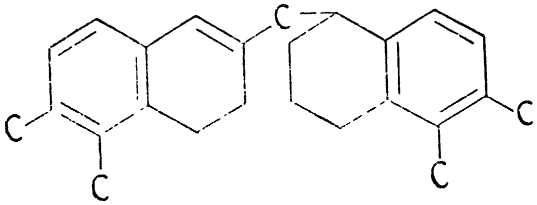
5,6,7,8-Dicyclopentano-1,2,3,4-tetramethyl-9,10-dihydroanthracene



M. P., °C
255–257[4]

$C_{25}H_{30}$

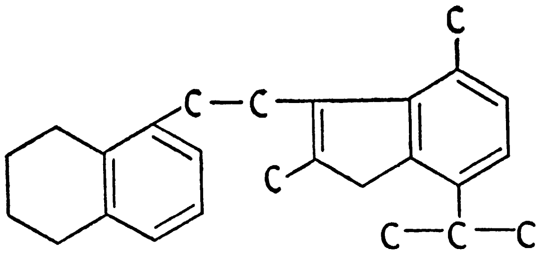
2-(5,6-Dimethyl-3,4-dihydronaphthyl)-1′-(5′,6′-dimethyl-1′,2′,3′,4′-tetrahydronaphthyl)-methane



B. P., °C @ 760mm
205–210 0.05[32]

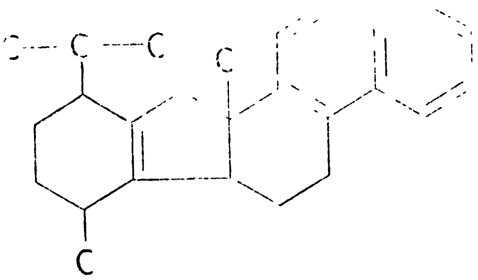
$C_{26}H_{32}$

1-[5′-(1′,2′,3′,4′-Tetrahydronaphthyl)]-2-[3″-(2″,4″-dimethyl-7″-isopropylindenyl)]-ethane



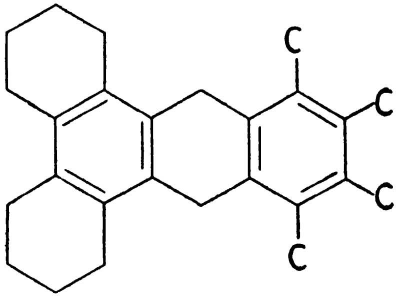
B. P., °C @ 760mm
218 0.3[12]

1,2-(2′,1′-Naphtho)-5,9a-dimethyl-8-isopropyl-3,4,4a,5,6,7,8,9a-octahydrofluorene



B. P., °C @ 760mm
215–220 0.3[12]

1,2,3,4-Tetramethyl-5,6,7,8-dicyclohexano-9,10-dihydroanthracene



M. P., °C
250–251[4]

References on Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-20}

1. Bachmann, W. E., and R. O. Edgerton, J. Am. Chem. Soc. **62**, 2550 **1940**.
2. Bachmann, W. E., and W. S. Struve, J. Org. Chem. **4**, 456 **1939**.

3. Bachmann, W. E., and W. S. Struve, J. Org. Chem. **5,** 416 **1940.**
4. Backer, H. J , and L. H. H. Huisman, Rec. trav. chim. **60,** 557 **1941;** C.A. **37,** 5982 **1943.**
5. Bally, O., and R. Scholl, Ber. **44,** 1656 **1911.**
6. Bergmann, E., and F. Bergmann, J. Am. Chem. Soc. **59,** 1443 **1937.**
7. Bergmann, E , and O. Blum-Bergmann, J. Am. Chem. Soc. **59,** 1441 **1937.**
8. Bergmann, E., and H. Taubadel, Ber. **65,** 463 **1931.**
9. Bradsher, C. K., J. Am. Chem. Soc. **61,** 3131 **1939.**
10. Brand, K., and K. O. Müller, Ber **55,** 601 **1922.**
11. Brand, K., K. O. Müller, and H. Kessler, Ber. **59,** 1962 **1926.**
12. Cook, J. W., C. L. Hewett, W. V. Mayneord, and E. Roe, J. Chem. Soc. **1934,** 1727.
13. Coulson, E. A., J. Chem. Soc **1935,** 77.
14. Coulson, E. A., J. Chem Soc **1937,** 1298.
15. Fieser, L. F., and J. Cason, J. Am Chem. Soc. **62,** 1293 **1940.**
16. Fieser, L. F., and W. H. Daudt, J. Am. Chem. Soc. **63,** 782 **1941.**
17. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **59,** 1028 **1937.**
18. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **60,** 940 **1938.**
19. Fieser, L. F., and W. S. Johnson, J. Am. Chem. Soc. **61,** 168 **1939.**
20. Fieser, L. F., and W. S. Johnson, J. Am. Chem. Soc. **61,** 1647 **1939.**
21. Fieser, L. F., and L. M. Joshel, J. Am. Chem. Soc. **61,** 2958 **1938.**
22. France, H., S. H. Tucker, and J. Forrest, J. Chem. Soc. **1945,** 7.
23. Godchot, M., Ann chim. phys. [8] **12,** 468 **1907.**
24. Godchot, M., Bull. soc. chim. [4] **1,** 121 **1907.**
25. Goldschmiedt, G., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **81,** Abt. I, 415 **1880.**
26. Jüngermann, E., Ber. **38,** 2868 **1905.**
27. Lerer, M., Ann. combustibles liquides **10,** 455 **1935.**
28. Nyman, G. A., Ann. Acad. Sci. Fennicae **A41,** No. 5; C.A. **30,** 2958 **1936;** Chem. Zentr. **1936,** I, 2348.
29. Pestemer, M., and F. Manchen, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **145,** Abt. IIb, 312 **1936.**
30. Risi, J., and D. Gauvin, Can. J. Research **13B,** 228 **1935.**
31. Ruzicka, L., and K. Hofmann, Helv. Chim. Acta **20,** 1155 **1937.**
32. Ruzicka, L., and K. Hofmann, Helv. Chim. Acta **22,** 126 **1939.**
33. Salzer, W., Z. physiol. Chem. **274,** 39 **1942.**
34. Scholl, R., and C. Seer, Ber. **44,** 1671 **1911.**
35. Schroeter, G., Ber. **57,** 2003 **1924.**
36. Shear, M. J., Am. J. Cancer **28,** 334 **1936.**
37. Stobbe, H., and F. Zschoch, Ber. **60,** 457 **1927.**
38. von Braun, J., O. Bayer, and L. F. Fieser, Ann. **459,** 287 **1927.**
39. von Braun, J., and G. Manz, Ber. **70,** 1603 **1937.**
40. Wieland, H., and E. Dane, Z. physiol. Chem. **219,** 240 **1933.**
41. Wieland, H., and O. Probst, Ann. **530,** 274 **1937.**
42. Willemart, A., Bull. soc. chim. [5] **6,** 204 **1939.**
43. Willemart, A., Compt. rend. **207,** 536 **1938.**
44. Zinke, A., and O. Benndorf, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **143,** Abt. IIb, 1 **1934.**
45. Zinke, A , and N. Schniderschitsch, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **138,** Abt. IIb, 28 **1929.**

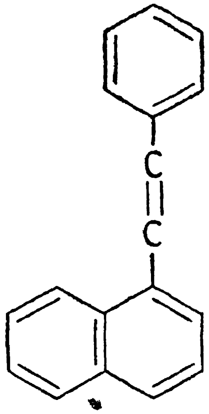
VIII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-22}

1. Naphthalene with Phenylalkenyl Substitutions
2. Anthracene and Phenanthrene Derivatives of Empirical Formula C_nH_{2n-22}
3. Cyclenoanthracenes, Cyclenophenanthrenes and Their Alkyl Derivatives
4. Benzofluorenes and Their Alkyl Derivatives
5. Pyrene and Its Alkyl Derivatives
6. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-22}

1. NAPHTHALENE WITH PHENYLALKENYL SUBSTITUTIONS, C_nH_{2n-22}

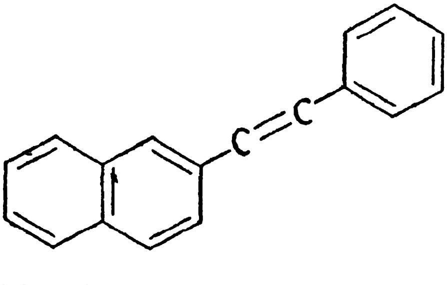
$C_{18}H_{14}$

1-Phenethenylnaphthalene



M. P., °C
72.5–73.5[2]

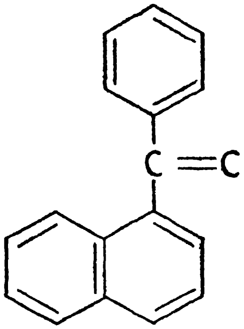
2-Phenethenylnaphthalene (a)



M. P., °C
205–207[12]

(a) The above formula was given for this compound, but the name given in the literature was "Phenyl-α-naphthylethylene."

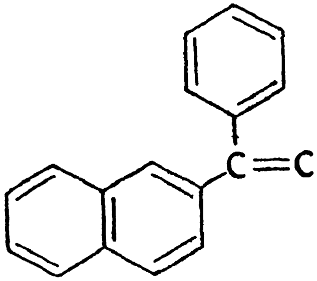
1-Phenyl-1-(1′-naphthyl)-ethene



M. P., °C
60[1,3]
59.5–60[11]

B. P., °C @ 760mm
350–355[1]
221-224 15[10]
195–196 9[11]

1-Phenyl-1-(2′-naphthyl)-ethene

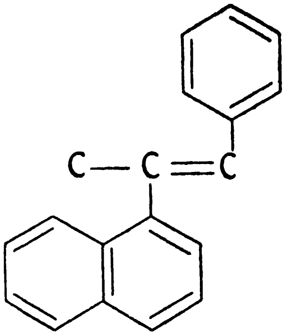


M. P., °C
52[3]

B. P., °C @ 760mm
220 24[3]

$C_{19}H_{16}$

1-Phenyl-2-(1′-naphthyl)-propene-1



M. P., °C

139[4]

---

x-Phenyl-x-(1′-naphthyl)-propene-x (a)

M. P., °C

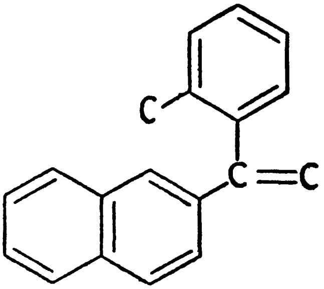
55–61[6]

B. P., °C @ 760mm

232–236	22–23[6]

(a) The structure of this compound was not clearly defined in the literature.

1-*o*-Tolyl-1-(2′-naphthyl)-ethene



M. P., °C

66–66.5[5]

---

x-*p*-Tolyl-x-(1′-naphthyl)-ethene (a)

B. P., °C @ 760mm

224–226	20[9]

D_4^{20}

1.0693	21.5°[9]

(a) The structure of this compound was not clearly defined in the literature.

$C_{21}H_{20}$

2-Methyl-3-phenyl-3-(x′-naphthyl)-butene-1 (a)

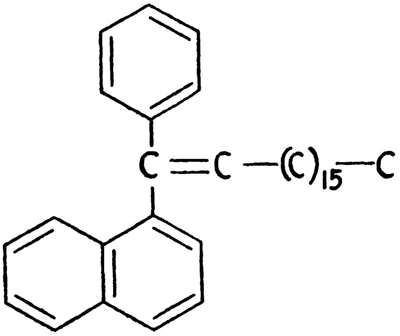
M. P., °C

85[8]

(a) The structure of this compound was not clearly defined in the literature.

$C_{34}H_{46}$

1-Phenyl-1-(1′-naphthyl)-octadecene-1



D_4^{20}

0.948 (a)[7]

n_D^{20}

1.5558[7]

(a) This constant is an extrapolated value.

References on Naphthalene with Phenylalkenyl Substitutions

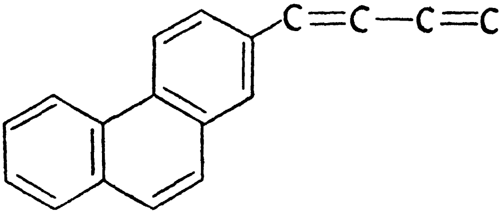
1. Acree, S. F., Ber. **37**, 2753 **1904**.
2. Balla, E., Compt. rend. **198**, 947 **1934**.
3. Bergmann, E., and A. Bondi, Ber. **66**, 286 **1933**.
4. Cook, J. W., and R. A. E. Galley, J. Chem. Soc. **1931**, 2012.

5. Fieser, L. F., and M. S. Newman, J. Am. Chem. Soc. **58**, 2376 **1936**.
6. Luce, E., Compt. rend. **180**, 145 **1925**.
7. Mikeska, L. A., Ind. Eng. Chem. **28**, 970 **1936**.
8. Ramart, P., Compt. rend. **179**, 634 **1924**.
9. Shurakovskiĭ, E., J. Russ. Phys. Chem. Soc. **41**, 1687 **1909**; C.A. **5**, 1097 **1911**; Chem. Zentr. **1910**, I, 1144.
10. Spilker, A., and W. Schade, Ber. **65**, 1686 **1932**.
11. Stoermer, R., and M Simon, Ber. **37**, 4163 **1904**.
12. Thiele, J., Ber. **32**, 1296 **1899**.

2. ANTHRACENE AND PHENANTHRENE DERIVATIVES OF EMPIRICAL FORMULA C_nH_{2n-22}

$C_{18}H_{14}$

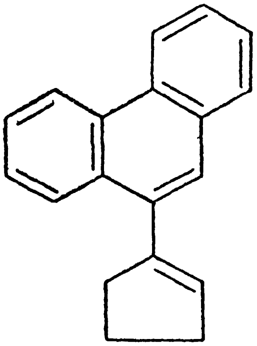
1-(2′-Phenanthryl)-butadiene-1,3



M. P., °C
125[6]

$C_{19}H_{16}$

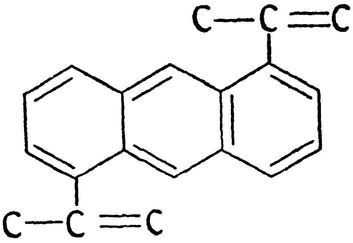
9-(Cyclopenten-1′-yl)-phenanthrene



B. P., °C @ 760mm
185 0.85[1]

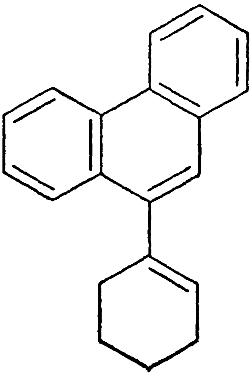
$C_{20}H_{18}$

1,5-Diisopropenylanthracene



M. P., °C
121[4]

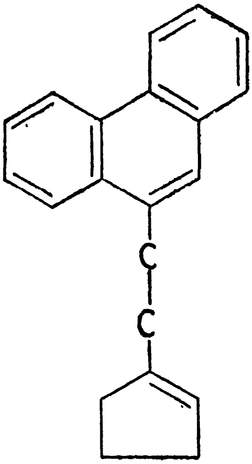
9-(Cyclohexen-1′-yl)-phenanthrene



M. P., °C
132[1]

$C_{21}H_{20}$

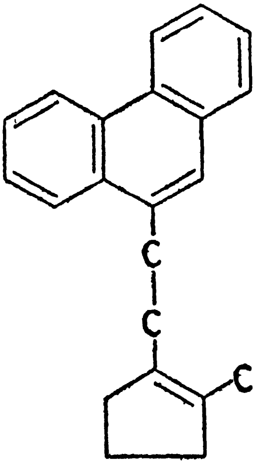
1-(Cyclopenten-1′-yl)-2-(9″-phenanthryl)-ethane



M. P., °C
105.5–107[2]

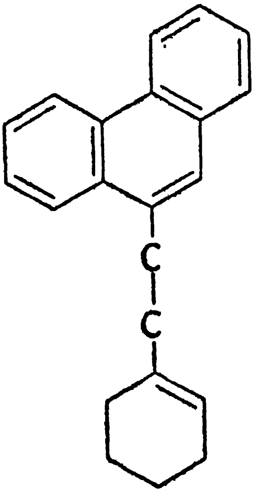
$C_{22}H_{22}$

1-(2′-Methylcyclopenten-1′-yl)-2-(9″-phenanthryl)-ethane



M. P., °C
73–75[2]

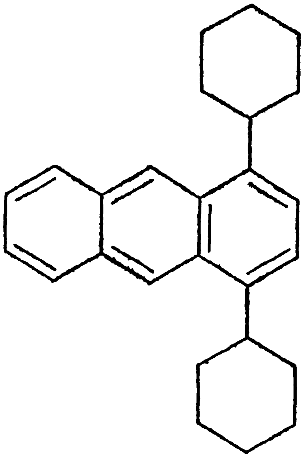
1-(Cyclohexen-1′-yl)-2-(9″-phenanthryl)-ethane



B. P., °C @ 760mm
205–206 0.4[5]

$C_{26}H_{30}$

1,4-Dicyclohexylanthracene



M. P., °C
160–161[3]

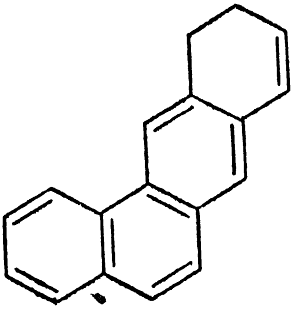
References on Anthracene and Phenanthrene Derivatives of Empirical Formula C_nH_{2n-22}

1. Bergmann, E., and F. Bergmann, J. Am. Chem. Soc. **59**, 1443 **1937**.
2. Bergmann, E., and O. Blum-Bergmann, J. Am. Chem. Soc. **58**, 1678 **1936**.
3. Buu-Hoï and P. Cagniant, Compt. rend. **216**, 381 **1943**; C.A. **38**, 2334 **1944**.
4. Coulson, E. A., J. Chem. Soc. **1930**, 1931.
5. Hewett, C. L., Gazz. chim. ital. **67**, 728 **1937**.
6. Kögl, F., H. Erxleben, and L. Jänecke, Ann. **482**, 105 **1930**.

3. CYCLENOANTHRACENES, CYCLENOPHENANTHRENES, AND THEIR ALKYL DERIVATIVES, C_nH_{2n-22}

$C_{18}H_{14}$

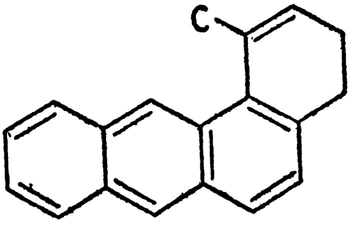
2,3-(Cyclohexen-5′-o)-phenanthrene



M. P., °C
112–113.5[1]

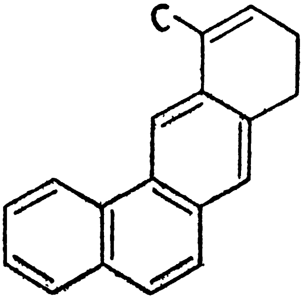
$C_{19}H_{16}$

1,2-(3′-Methylcyclohexen-3′-o)-anthracene



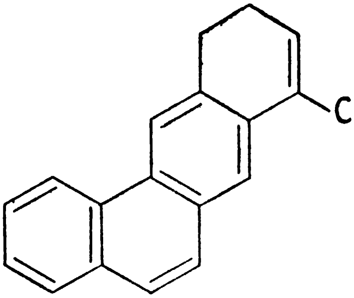
M. P., °C
74–75[4]

2,3-(3′-Methylcyclohexen-3′-o)-phenanthrene



M. P., °C
80–80.6[6]

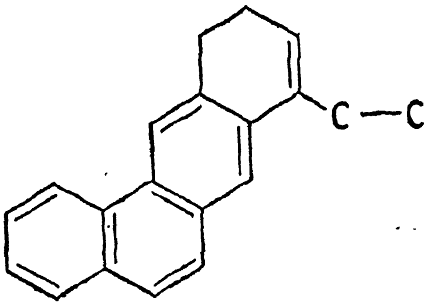
2,3-(6′-Methylcyclohexen-5′-o)-phenanthrene



M. P., °C
118–118.5[3]

$C_{20}H_{18}$

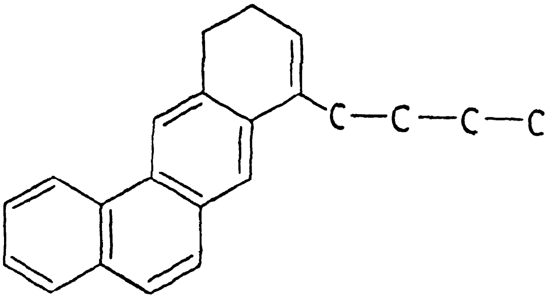
2,3-(6′-Ethylcyclohexen-5′-o)-phenanthrene



M. P., °C
110–112[2]
109–110[5]

$C_{22}H_{22}$

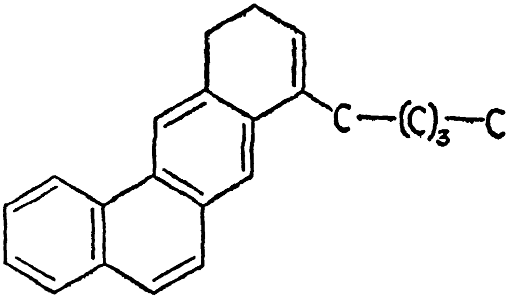
2,3-(6′-*n*-Butylcyclohexene-5′-o)-phenanthrene



M. P., °C
69–70[5]

$C_{23}H_{24}$

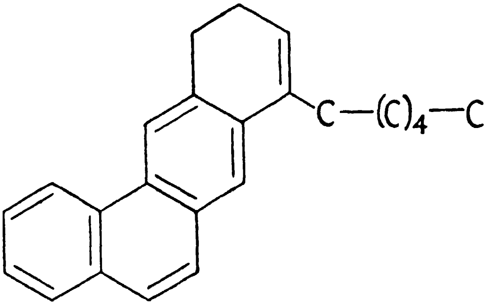
2,3-(6′-*n*-Pentylcyclohexen-5′-o)-phenanthrene



M. P., °C
59–60[5]

$C_{24}H_{26}$

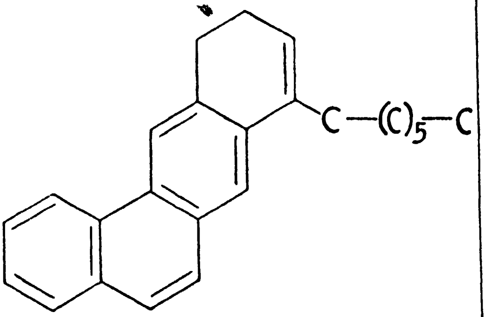
2,3-(6′-*n*-Hexylcyclohexen-5′-o)-phenanthrene



M. P., °C
47–48[5]

$C_{25}H_{28}$

2,3-(6′-*n*-Heptylcyclohexen-5′-o)-phenenthrene



M. P., °C
53–54[5]

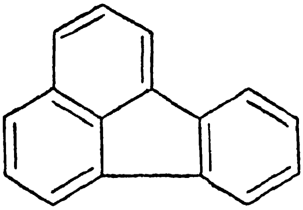
References on Cyclenoanthracenes, Cyclenophenanthrenes, and Their Alkyl Derivatives

1. Bachmann, W. E., J. Org. Chem. **3**, 434 **1938–39.**
2. Bachmann, W. E., and J. M. Chemerda, J. Am. Chem. Soc. **61**, 2358 **1939.**
3. Bachmann, W. E., and A. L. Wilds, J. Am. Chem. Soc. **60**, 624 **1938.**
4. Cook, J. W., and A. M. Robinson, J. Chem. Soc. **1938**, 505.
5. Cook, J. W., and A. M. Robinson, J. Chem. Soc. **1940**, 303.
6. Fieser, L. F., and W. S. Johnson, J. Am. Chem. Soc. **61**, 1647 **1939.**

4. BENZOFLUORENES AND THEIR ALKYL DERIVATIVES, C_nH_{2n-22}

$C_{16}H_{10}$

Benzo-[jk]-fluorene
(Fluoranthene)
(Idryl)



M. P., °C
110
110.0–110.7[9]
110[15, 16, 27, 28]
109–110[31]
109[12, 13, 20, 30]
108–109[25]

B. P., °C @ 760mm

393[10]	
382–383	749[22]
250–251	60[14]
250	60[30]
217	30[14]

D_4^{20}

1.0996	18.7°[27]
1.1045	15.2°[27]
1.236 (a) (solid)[21]	

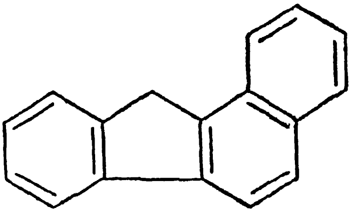
n_D^{20}

1.62768	$n_{H\alpha}^{18.7}$[27]
1.63314	$n_{H\alpha}^{15.2}$[27]
1.66107	$n_{H\beta}^{18.7}$[27]
1.66772	$n_{H\beta}^{15.2}$[27]
1.63693	$n_{He}^{18.7}$[27]
1.64269	$n_{He}^{15.2}$[27]

(a)The temperature of this determination was not given.

$C_{17}H_{12}$

1,2-Benzofluorene
(Chrysofluorene)



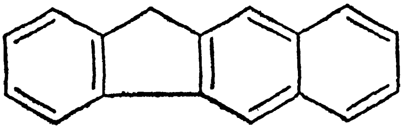
M. P., °C
186.5
189–190[23]
188[2, 17]
187–188[1]
186–187[18]
186[19]
183–184[6]
182–183[7]
182[8]

B. P., °C @ 760mm

413[17]	
398–400	758[23]

2,3-Benzofluorene

(Isonaphthofluorene)

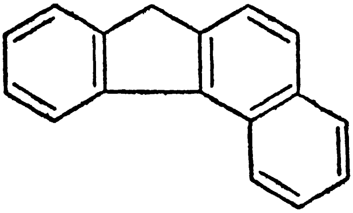


M. P., °C
209[24]
208–209[23]
208[3, 26]

B. P., °C @ 760mm

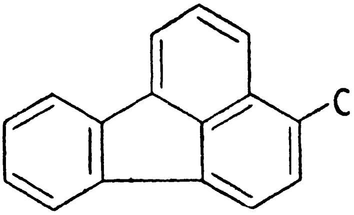
401–402	758[23]

3,4-Benzofluorene



M. P., °C
124–125[5]

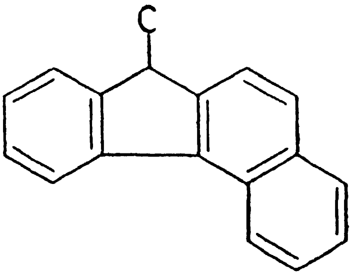
Benzo-[lm]-2-methylfluorene



M. P., °C
66[29]

$C_{18}H_{14}$

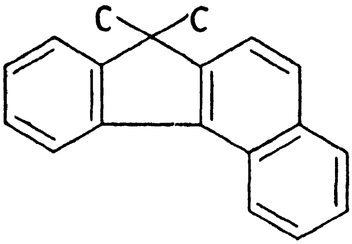
3,4-Benzo-9-methylfluorene



M. P., °C
80.8–82.0[11]

$C_{19}H_{16}$

3,4-Benzo-9,9-dimethylfluorene



M. P., °C
148–148.5[4]

References on Benzofluorenes and Their Alkyl Derivatives

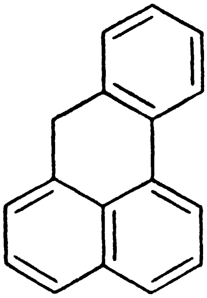
1. Bamberger, E., and J. Kranzfeld, Ber. **18,** 1931 **1885.**
2. Bamberger and Kranzfeld through C. Graebe, Ann. **335,** 135 **1904.**
3. Barnett, E. de B., N. F. Goodway, and J. W. Watson, Ber. **66,** 1876 **1933.**
4. Bradsher, C. K , and A. S. Burhans, J. Am. Chem. Soc. **62,** 3140 **1940.**
5. Cook, J. W., A. Dansi, C. L. Hewett, J. Iball, W. V. Mayneord, and E. Roe, J. Chem. Soc. **1935,** 1319.
6. Cook, J. W., and C.L. Hewett, J. Chem. Soc. **1934,** 365.
7. Cook, J. W., C. L. Hewett, W. V. Mayneord, and E. Roe, J. Chem. Soc. **1934,** 1727.
8. Cook, J. W., and R. W. G. Preston, J. Chem. Soc. **1944,** 553.
9. Davis, W. W., M. E. Krahl, and G. H. A. Clowes, J. Am. Chem. Soc. **62,** 3080 **1940.**
10. Decker, H., Ber. **67,** 1636 **1934.**
11. Fieser, L. F., and L. M. Joshel, J. Am. Chem. Soc. **62,** 957 **1940.**
12. Fittig, R., and F. Gebhard, Ann. **193,** 142 **1878.**
13. Fittig, R., and F. Gebhard, Ber. **10,** 2141 **1877.**
14. Fittig, R., and H. Liepmann, Ann. **200,** 1 **1880.**
15. Goldschmiedt, G., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **81,** Abt. I, 415 **1880.**
16. Goldschmiedt, G., and M. von Schmidt, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **83,** Abt. IIb, 7 **1881.**
17. Graebe, C., Ann. **335,** 122 **1904.**

25. von Braun, J., and E. Rath, Ber. **61,** 956 **1928.**
26. Weger, M., Z. angew. Chem. **22,** 338 **1909.**
27. Weitzenböck, R., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **121,** Abt. IIb, 1227 **1912.**
28. Winterstein, A., and K. Schön, Z. physiol. Chem. **230,** 146 **1934.**
29. Winterstein, A., K. Schön, and H. Vetter, Z. physiol. Chem. **230,** 158 **1934.**
30. Zanetti, J. E., and G. Egloff, Ind. Eng. Chem. **9,** 474 **1917.**

6. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-22}

$C_{17}H_{12}$

2,3-Benzophenalan
(Benzanthrene)
(Isochrysofluorene)



M. P., °C
$84^{6,14}$
$81–82^{18}$

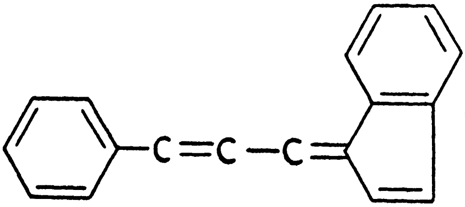
1,x-Naphthylenephenylenemethane (a)

M. P., °C
76^{38}

(a) The naphthylene bond may be in either the 2- or 8-position.

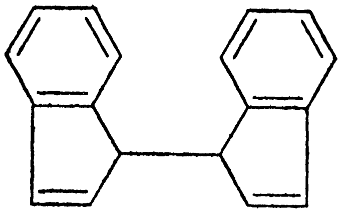
$C_{18}H_{14}$

1-Phenyl-3-indenylidenepropene-1



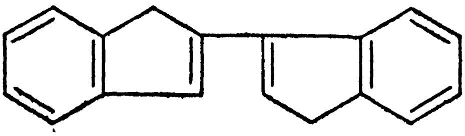
M. P., °C
190^{50}

1,1′-Biindenyl



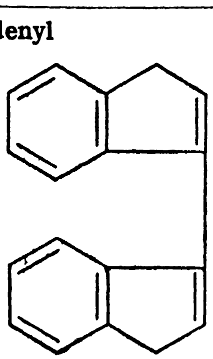
M. P., °C
$99–100^{23,29}$
98^{49}

2,3′-Biindenyl



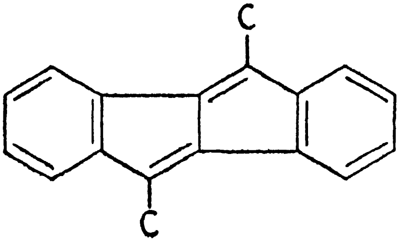
M. P., °C
$57–58^{48}$
56^{46}

3,3′-Biindenyl



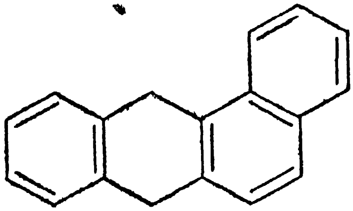
M. P., °C
130.5–131.5^{19}
130–131.5^{49}
129.5–130.5^{49}

3,4,7,8-Dibenzo-2,6-dimethyl-bicyclo-[3,3,0]-octadiene-1,5



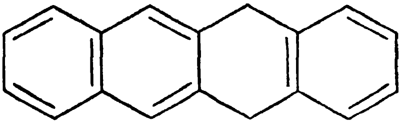
M. P., °C
212^{11}

1,2-Benzo-9,10-dihydroanthracene



M. P., °C
112–112.5^{1}

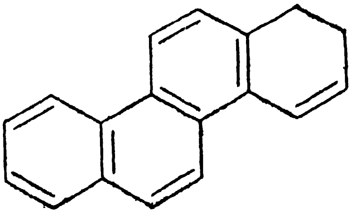
5,12-Dihydronaphthacene



M. P., °C
212–213^{24}
212^{17}
207^{28}
206–207^{37}

B. P., °C @ 760mm
ca. 400^{37}

1,2-Dihydrochrysene



M. P., °C
182.5–184.5^{4}

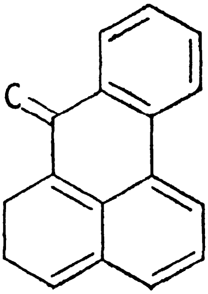
---

x,x-Dihydrochrysene (a)

M. P., °C
167–169^{44}

(a) The structure of this compound was not clearly defined in the literature.

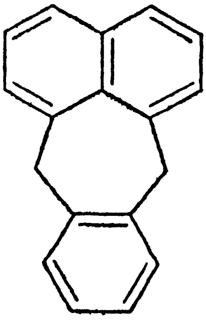
2,3-Benzo-1-methylene-8,9-dihydrophenalan



M. P., °C
155–156$^{12, 13}$

Naphtho-[1,8-ab]-benzo-[e]-cycloheptane

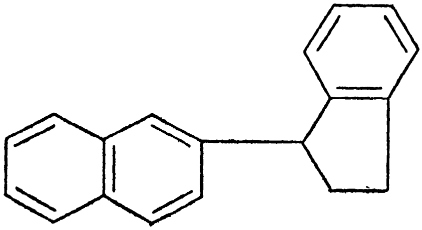
(Pleiadene)



M. P., °C
116.5[45]

$C_{19}H_{16}$

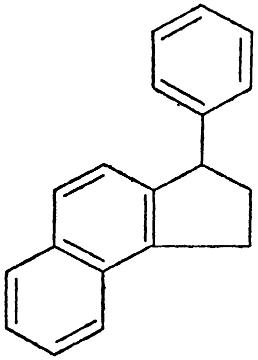
2-(1′-Indanyl)-naphthalene



M. P., °C
52–53[21]
47[52]

B. P., °C @ 760mm
229–230 13[52]

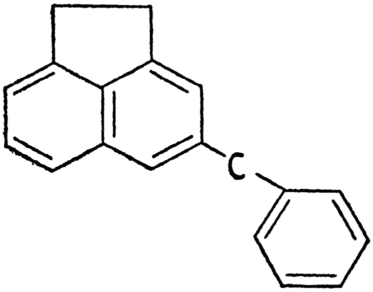
1-Phenyl-4,5-benzoindane



M. P., °C
79[52]

B. P., °C @ 760mm
226–229 13[52]

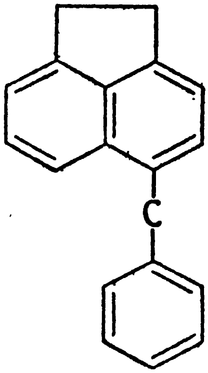
4-Benzylacenaphthene



M. P., °C
45–46[26]

B. P., °C @ 760mm
260–265 20[26]

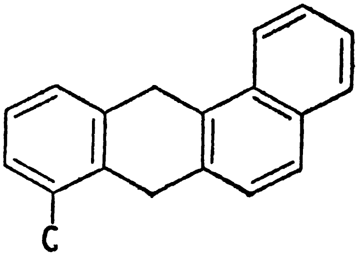
5-Benzylacenaphthene



M. P., °C
112–113[25]
111–112[42]
110–111[26, 27]

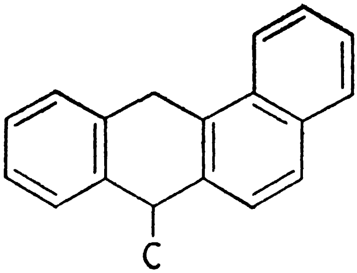
B. P., °C @ 760mm
ca. 340–315[25]
210–215 13[27]

1,2-Benzo-5-methyl-9,10-dihydroanthracene



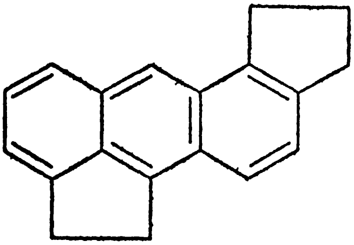
M. P., °C
128–129.5[3]

1,2-Benzo-10-methyl-9,10-dihydroanthracene



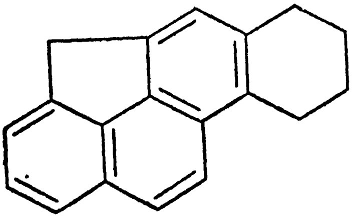
M. P., °C
94.4–94.9[31]

Dicyclopentano-[a,fg]-anthracene



M. P., °C
174–176[30]

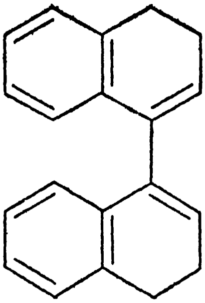
Cyclopentano-[mno]-1,2,3,4-tetrahydrochrysene



M. P., °C
129–129.4[29]
127.5–128.5[29]

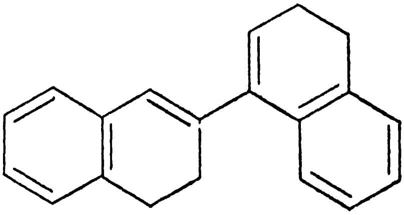
$C_{20}H_{18}$

3,4,3′,4′-Tetrahydro-1,1′-binaphthyl



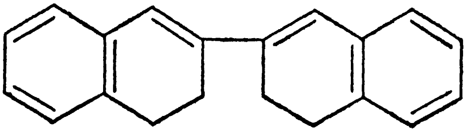
M. P., °C
141[54]
140[8]
139–140[47]

3,4,3′,4′-Tetrahydro-1,2′-binaphthyl



M. P., °C
87[53]

3,4,3′4′-Tetrahydro-2,2′-binaphthyl



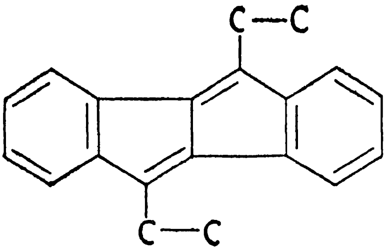
M. P., °C
156[51]
153[53]

---

x,x-Dihydro-x-benzylfluorene (a)
M. P., °C
71[41]

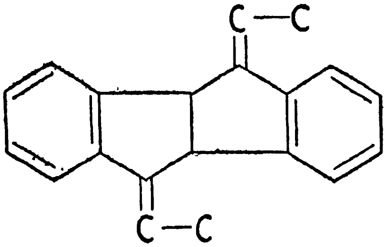
(a) The structure of this compound was not clearly defined in the literature.

3,4,7,8-Dibenzo-2,6-diethylbicyclo-[3,3,0]-octadiene-1,5



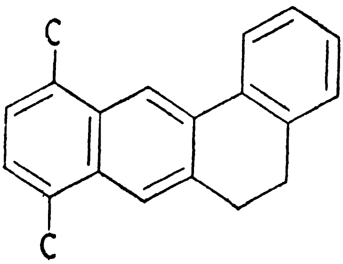
M. P., °C
154^{11}

3,4,7,8-Dibenzo-2,6-diethylidene-bicyclo-[3,3,0]-octane



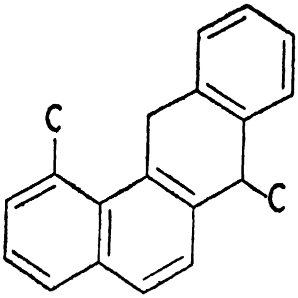
M. P., °C
199.5^{11}

1,2-Benzo-5,8-dimethyl-3,4-dihydroanthracene



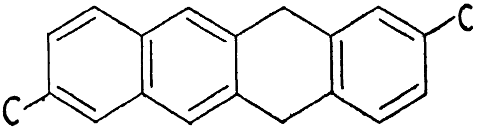
M. P., °C
$82.2\text{–}82.8^{32}$

2,3-Benzo-1,5-dimethyl-1,4-dihydrophenanthrene



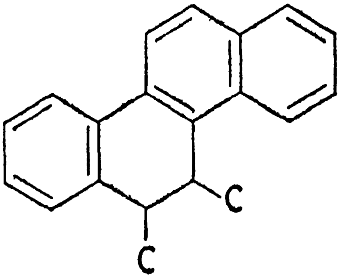
M. P., °C
$108\text{–}109^{35}$

2,8-Dimethyl-5,12-dihydronaphthacene



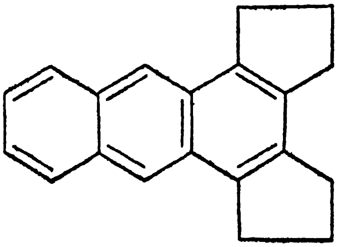
M. P., °C
217^{22}

5,6-Dimethyl-5,6-dihydrochrysene



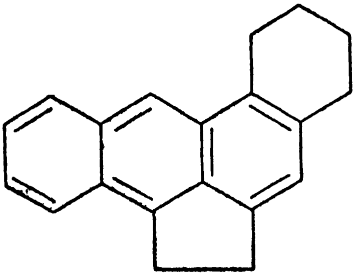
M. P., °C
$104\text{–}104.5^{40}$

1,2,3,4-Dicyclopentanoanthracene



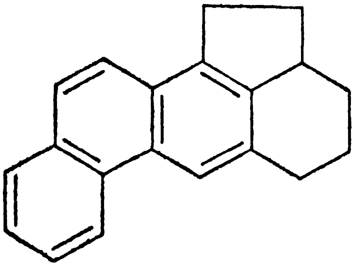
M. P., °C
146[8]

Cyclohexano-[a]-cyclopentano-[de]-anthracene



M. P., °C
106–107[34]

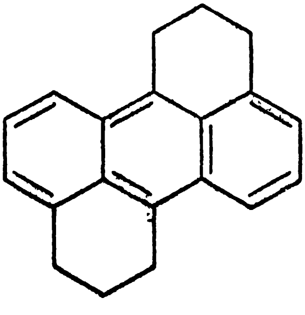
2a,3,4,5-Tetrahydrocholanthrene



M. P., °C
107 (a)[2]
101–101.5 (a)[2]

(a) These constants were determined on different crystalline forms.

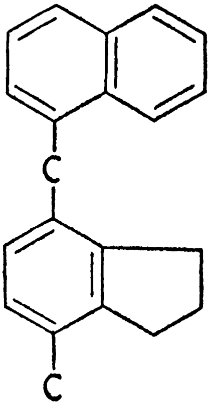
1,2,3,7,8,9-Hexahydroperylene



M. P., °C
189[56]
182–185[55]
183–184[57]
183[43]

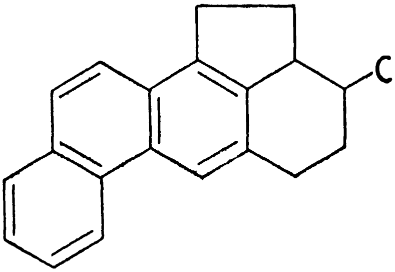
$C_{21}H_{20}$

(1′-Naphthyl)-[4′-(7′-methylindanyl)]-methane



B. P., °C @ 760mm
221–226 4[33]

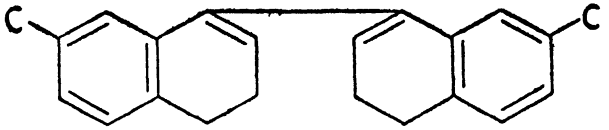
3-Methyl-2a,3,4,5-tetrahydrocholanthrene



M. P., °C
97–99[9]

$C_{22}H_{22}$

7,7′-Dimethyl-3,4,3′,4′-tetrahydro-1,1′-binaphthyl



M. P., °C 162–163^{15,16}

x_8-Octahydro-1,2,3,4-dibenzoanthracene (a)

M. P., °C

129^{7}

(a) The structure of this compound was not clearly defined in the literature.

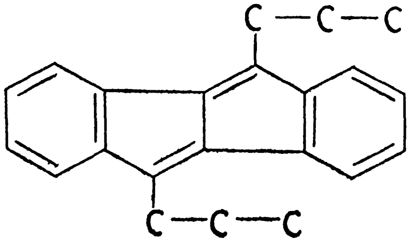
x_8-Octahydro-1,2,5,6-dibenzoanthracene (a)

M. P., °C

188–190^{19,20}

(a) The structure of this compound was not clearly defined in the literature.

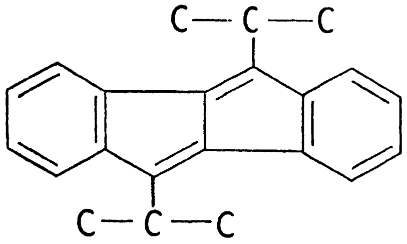
3,4,7,8-Dibenzo-2,6-di-*n*-propylbicyclo-[3,3,0]-octadiene-1,5



M. P., °C

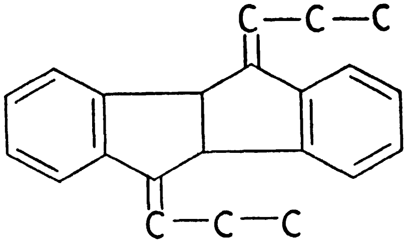
135-136^{10}

3,4,7,8-Dibenzo-2,6-diisopropylbicyclo-[3,3,0]-octadiene-1,5



M. P., °C 178–179^{10}

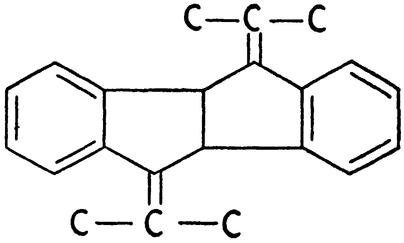
3,4,7,8-Dibenzo-2,6-di-*n*-propylidenebicyclo-[3,3,0]-octane



M. P., °C

157–158^{10}

3,4,7,8-Dibenzo-2,6-diisopropylidenebicyclo-[3,3,0]-octane

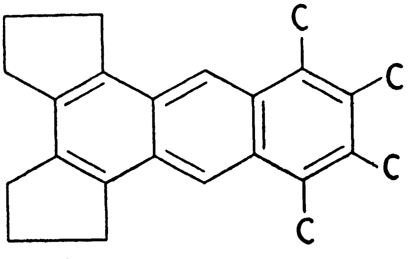


M. P., °C

189^{10}

$C_{24}H_{26}$

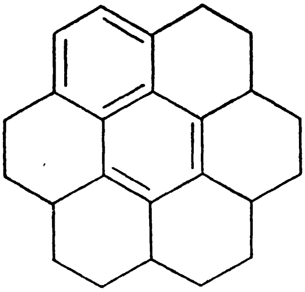
1,2,3,4-Tetramethyl-5,6,7,8-dicyclopentanoanthracene



M. P., °C

296–297^{5}

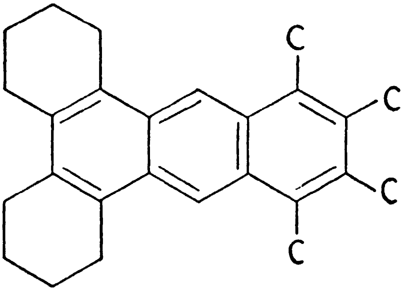
1,2,2a,3,4,4a,5,6,6a,7,8,8a,9,10-Tetradecahydrocoronene



M. P., °C
277–278[36]

$C_{26}H_{30}$

1,2,3,4-Tetramethyl-5,6,7,8-dicyclohexanoanthracene



M. P., °C
272–273[5]

References on Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-22}

1. Bachmann, W. E., J. Org. Chem. **1**, 347 **1936–37.**
2. Bachmann, W. E., J. Org. Chem. **3**, 434 **1938–39.**
3. Bachmann, W. E., and L. H. Pence, J. Am. Chem. Soc. **59**, 2339 **1937.**
4. Bachmann, W. E., and W. S. Struve, J. Org. Chem. **4**, 456 **1939.**
5. Backer, H. J., and L. H. H. Huisman, Rec. trav. chim. **60**, 557 **1941**; C.A. **37**, 5982 **1943.**
6. Bally, O., and R. Scholl, Ber. **44**, 1656 **1911.**
7. Barnett, E. de B., N. F. Goodway, and C. A. Lawrence, J. Chem. Soc. **1935**, 1684.
8. Barnett, E. de B., and C. A. Lawrence, J. Chem. Soc. **1935**, 1104.
9. Bergmann, E., and O Blum-Bergmann, J. Am. Chem. Soc. **59**, 1573 **1937.**
10. Brand, K., and T. Sasaki, Ber. **58**, 2546 **1925.**
11. Brand, K., and F. Schlager, Ber. **56**, 2541 **1923.**
12. Charrier, G., and E. Ghigi, Atti accad. Lincei [6] **16**, 257 **1932.**
13. Charrier, G., and E. Ghigi, Gazz. chim. ital. **62**, 928 **1932.**
14. Chatterjee, N. N., and H. B. Roy, J. Indian Chem. Soc. **20**, 329 **1943.**
15. Chu, E. J. H , and Z.-I. Shen, J. Chinese Chem. Soc. **10**, 113 **1943**; Brit. Chem. Abstracts AII, **1944**, 190.
16. Chu, E. J. H., and Z.-I. Shen, J. Chinese Chem. Soc **10**, 119 **1943**; C.A. **38**, 2951 **1943.**
17. Clar, E., Ber. **75**, 1271 **1942.**
18. Clar, E., and F. Furnari, Ber. **65**, 1420 **1932.**
19. Cook, J. W., J. Chem. Soc. **1931**, 487.
20. Cook, J. W., J. Chem. Soc. **1931**, 489.
21. Cook, J. W., and G. A. D. Haslewood, J. Chem. Soc. **1935**, 770.
22. Coulson, E. A., J. Chem. Soc. **1934**, 1406.
23. Courtot, C., Ann. chim. [9] **4**, 68 **1915.**
24. Dufraisse, C., and R. Horclois, Bull. soc. chim. [5] **3**, 1880 **1936.**
25. Dziewoński, C., and E. Dotta, Bull. soc. chim. [3] **31**, 373 **1904.**
26. Dziewoński, K., and K. Leonhard, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1928A**, 99
27. Dziewoński, K., and M. Rychlik, Ber. **58**, 2239 **1925.**
28. Fieser, L. F., J. Am. Chem. Soc. **53**, 2329 **1931.**
29. Fieser, L. F., and J. Cason, J. Am. Chem. Soc. **62**, 1293 **1940.**
30. Fieser, L. F., and E. B. Hershberg, J. Am Chem. Soc. **59**, 394 **1937.**
31. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **59**, 2502 **1937.**
32. Fieser, L. F., and W. S. Johnson, J. Am. Chem. Soc. **61**, 1647 **1939.**
33. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **58**, 2482 **1936.**

34. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **59,** 883 **1937.**
35. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **60,** 170 **1938.**
36. Fromherz, H., L. Thaler, and G. Wolf Z. Elektrochem. **49,** 387 **1943.**
37. Gabriel, S., and E. Leupold. Ber **31** 1272 **1898.**
38. Graebe, C., Ber. **27,** 952 **1894.**
39. Grignard, V., and C. Courtot, Compt. rend. **154,** 362 **1912.**
40. Hewett, C. L., J. Chem. Soc. **1940.** 293.
41. Kliegl, A., F. Weng, and G. Wiest, Ber. **63,** 1262 **1930.**
42. Lorriman, F. R., J. Am. Chem. Soc. **47,** 211 **1925.**
43. Mason, F. A., Ind. Chemist **5,** 111 **1929.**
44. Mohler, H., and J. Sorge, Helv. Chim. Acta **22,** 229 **1939.**
45. Rieche, A., H. Sauthoff, and O. Müller, Ber. **65,** 1371 **1932.**
46. Risi, J., and D. Gauvin, Can. J. Research **13B,** 228 **1935.**
47. Schroeter, G., Ber. **58,** 713 **1925.**
48. Stobbe, H., and E. Färber, Ber. **57,** 1838 **1924.**
49. Straus, F., R. Kühnel, and R. Haensel, Ber. **66,** 1847 **1933.**
50. Thiele, J., Ber. **33,** 3395 **1900.**
51. von Braun, J., and G. Kirschbaum, Ber. **54,** 597 **1921.**
52. von Braun, J., G. Manz, and E. Reinsch, Ann. **468,** 277 **1929.**
53. Weidlich, H. A., Ber. **71,** 1201 **1938.**
54. Weidlich, H. A., Ber. **71,** 1203 **1938.**
55. Zinke, A., and O. Benndorf, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **143,** Abt. IIb, 1 **1934.**
56. Zinke, A., and N. Schniderschitsch, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **138,** Abt. IIb, 28 **1929.**
57. Zinke, A., and E. Unterkreuter, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **128,** Abt. IIb, 153 **1919.**

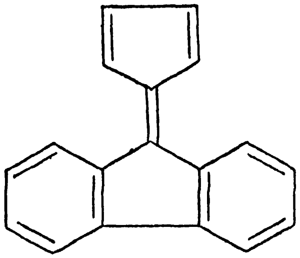
IX. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-24}

1. Fluorene Derivatives of Empirical Formula C_nH_{2n-24}
2. Dihydroanthracenes and Dihydrophenanthrenes with One Phenyl Substitution
3. 1,2-Benzoanthracene and Its Alkyl Derivatives
4. 3,4-Benzophenanthrene and Its Alkyl Derivatives
5. Naphthacene and Its Alkyl Derivatives
6. Chrysene and Its Alkyl Derivatives
7. Triphenylene and Its Alkyl Derivatives
8. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-24}

1. FLUORENE DERIVATIVES OF EMPIRICAL FORMULA C_nH_{2n-24}

$C_{18}H_{12}$

9-(Cyclopentadien-2′,4′-ylidene)-fluorene

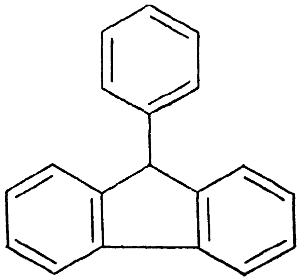


M. P., °C

133–135[7]

$C_{19}H_{14}$

9-Phenylfluorene



M. P., °C

146

148.5[17]

147–148[35]

146–148[37]

147[27, 37, 38]

146[1]

145–146[11, 12, 31]

145.5[18, 19, 20]

145 (a)

144[4, 15]

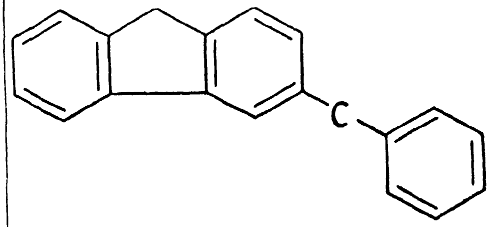
D_4^{20}

1.232 0° [41]

(a) The melting point 145 is found in references 23, 24, 25, 28, 30, 33, 40.

$C_{20}H_{16}$

3-Benzylfluorene



M. P., °C

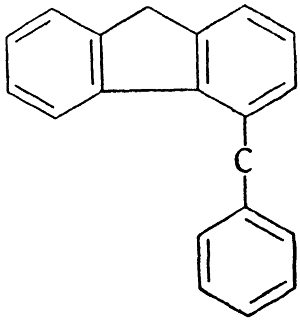
106.5[10]

106[8]

104–106[13]

102[14]

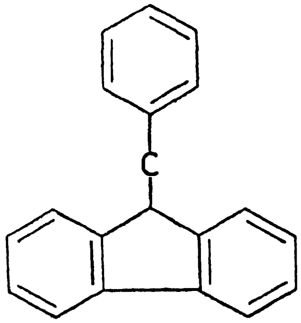
4-Benzylfluorene



M. P., °C

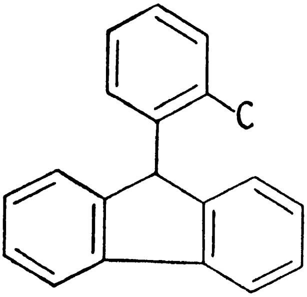
77[16]

9-Benzylfluorene



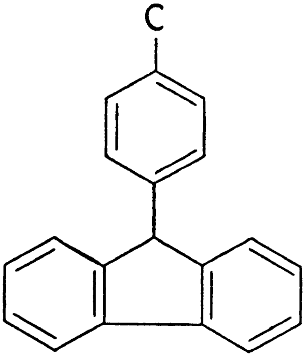
M. P., °C
133
134–135[39]
134[34]
133[5]
131–132[2]
130–131[32]

9-*o*-Tolylfluorene



M. P., °C
133[36]

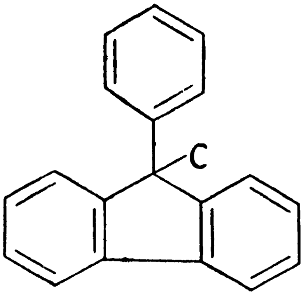
9-*p*-Tolylfluorene



M. P., °C
128 (a)[18]
124[21]

(a) The structure of this compound was not clearly defined in the literature.

9-Methyl-9-phenylfluorene

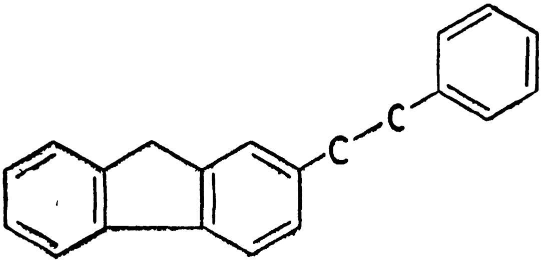


M. P., °C
84-85[3]

This series continued on next page

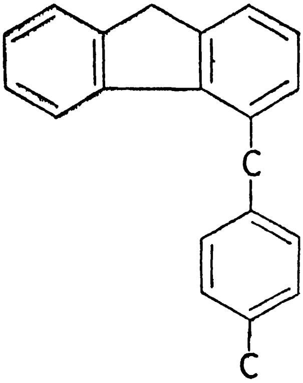
$C_{21}H_{18}$

2-Phenethylfluorene



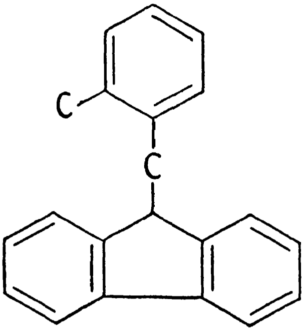
M. P., °C
113–114[6]

4-(4′-Methylbenzyl)-fluorene



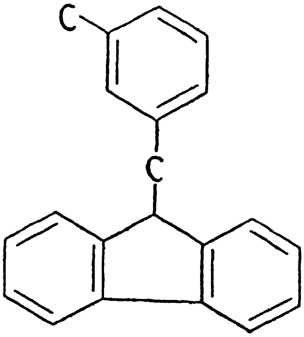
M. P., °C
72[26]

9-(2′-Methylbenzyl)-fluorene



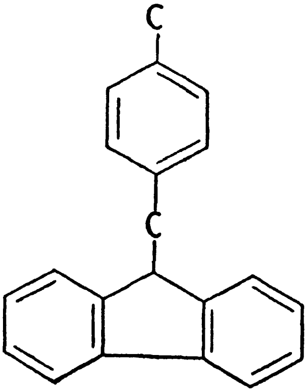
M. P., °C
71–72[29]

9-(3′-Methylbenzyl)-fluorene



M. P., °C
111–112[9]

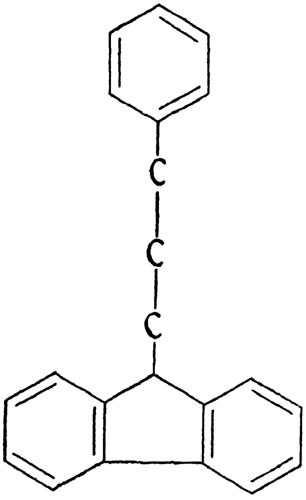
9-(4′-Methylbenzyl)-fluorene



M. P., °C
136–137[29]

$C_{22}H_{20}$

1-Phenyl-3-(9′-fluoryl)-propane



M. P., °C
75–76[2]
71[22]

References on Fluorene Derivatives of Empirical Formula C_nH_{2n-24}

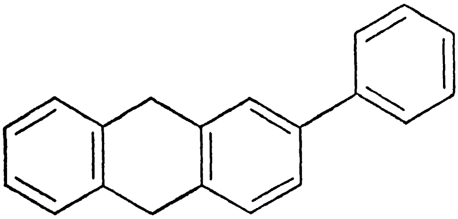
1. Bachmann, W. E., J. Am. Chem. Soc. **52,** 3287 **1930.**
2. Bergmann, E., Ber. **63,** 1617 **1930.**
3. Bergmann, E., and A. Bondi, Ber. **64,** 1455 **1931.**
4. Boeseken, J., Rec. trav. chim. **22,** 301 **1903.**
5. Brown, W. G., and B. A. Bluestein, J. Am. Chem. Soc. **65,** 1082 **1943.**
6. Cook, J. W., and R. W. G. Preston, J. Chem. Soc. **1944,** 553.
7. Courtot, C., Ann. chim. [9] **4,** 168 **1915.**
8. Dansi, A., and A. Sempronj, Gazz. chim. ital. **64,** 218 **1934.**
9. De Fazi, R., Gazz. chim. ital. **51,** I, 328 **1921.**
10. Dziewoński, K., and Z. Reicher, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1931A,** 643.
11. Fischer, E., and O. Fischer, Ann. **194,** 242 **1878.**
12. Fischer, E., and O. Fischer, Ber. **11,** 612 **1878.**
13. Fortner, M., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **111,** Abt. IIb, 741 **1902.**
14. Goldschmiedt, G., Sitzber. Akad. Wiss. Wien, Math naturw. Klasse **84,** Abt. IIb, 305 **1881.**
15. Gomberg, M., and L. H. Cone, Ber. **37,** 3538 **1904.**
16. Gotz, R., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **110,** Abt. IIb, 1037 **1901.**
17. Hanriot, M., and O. Saint-Pierre, Bull. soc. chim. [3] **1,** 774 **1889.**
18. Hemilian, W., Ber. **11,** 202 **1878.**
19. Hemilian, W., Ber. **11** 837 **1878.**
20. Kliegl, A., Ber. **38,** 284 **1905.**
21. Kovache, A., Ann. chim. [9] **10,** 184 **1918.**
22. Kuhn, R., and A Winterstein, Helv. Chim. Acta **11,** 123 **1928.**
23. McVicker, W. H., J K. Marsh, and A. W. Stewart, J. Chem. Soc. **127,** 999 **1925.**
24. Meyer, R., and E. Saul, Ber. **25,** 3586 **1892.**
25. Nef, J. U., Ann. **309,** 126 **1899.**
26. Pick, H., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **113,** Abt. IIb, 649 **1904.**
27. Pinck, L. A., J. Am. Chem. Soc. **55,** 1711 **1933.**
28. Ramart-Lucas and J. Hoch, Bull. soc. chim. [5] **2,** 1376 **1935.**
29. Sieglitz, A., and H. Jassoy, Ber. **54,** 2133 **1921.**
30. Staudinger, H., Ber. **39,** 3060 **1906.**
31. Steiglitz, J., and R. L. Brown, J. Am. Chem. Soc. **44,** 1270 **1922.**
32. Thiele, J., and F. Henle, Ann. **347,** 290 **1906.**
33. Ullmann, F., and R. von Wurstemberger, Ber. **37,** 73 **1904.**
34. Vansheidt, A., and B. Moldavski, Ber. **64,** 917 **1931.**
35. Vorlander, D., and A. Pritzsche, Ber. **46,** 1793 **1913.**
36. Weiss, R., and E. Knapp, Monatsh. **61,** 61 **1932.**
37. Werner, A., and A. Grob, Ber. **37,** 2887 **1904.**
38. Wieland, H., K. Heymann, T. Tsatsas, D. Juchum, G. Varvoglis, G. Labriola,

O. Dobbelstein, and H. S. Boyd-Barrett, Ann. **514**, 145 **1934**.
39. Wislicenus, W., and W. Mocker, Ber. **46**, 2772 **1913**.
40. Zelinskiĭ, N. D., and M. V. Gaverdovskaya, Ber. **61**, 1049 **1928**.
41. Ziegler, K., and F. Ditzel, Ann. **473**, 194 **1929**.

2. DIHYDROANTHRACENES AND DIHYDROPHENANTHRENES WITH ONE PHENYL SUBSTITUTION, C_nH_{2n-24}

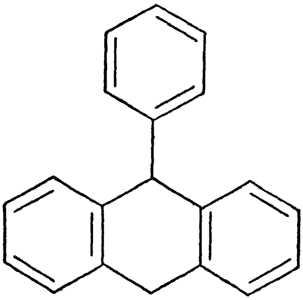
$C_{20}H_{16}$

2-Phenyl-9,10-dihydroanthracene



M. P., °C
93–96[16]

9-Phenyl-9,10-dihydroanthracene



M. P., °C
90–91[11]
90[9]
87[15]

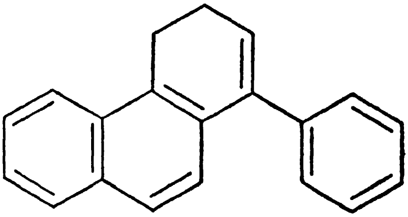
---

x-Phenyl-x,x-dihydroanthracene (a)

M. P., °C
123[15]
120–120.5[17]

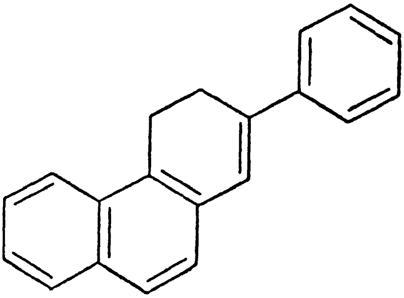
(a) The structure of this compound was not clearly defined in the literature.

1-Phenyl-3,4-dihydrophenanthrene



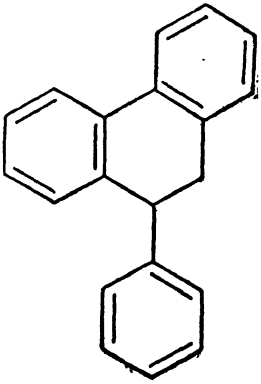
M. P., °C
98[2]

2-Phenyl-3,4-dihydrophenanthrene



M. P., °C
150.6–151.0[14]

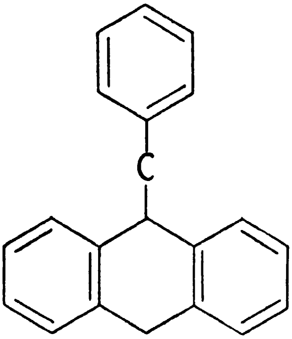
9-Phenyl-9,10-dihydrophenanthrene



M. P., °C
121.5[10]
84[4]

$C_{21}H_{18}$

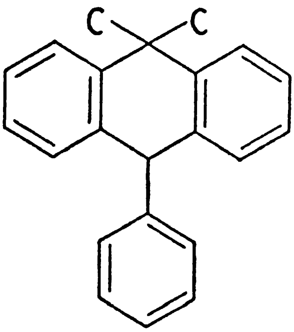
9-Benzyl-9,10-dihydroanthracene



M. P., °C
119-120[6, 7]
110-111[1]

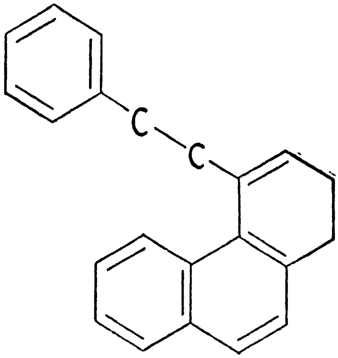
$C_{22}H_{20}$

9,9-Dimethyl-10-phenyl-9,10-dihydroanthracene



M. P., °C
145-146[5]

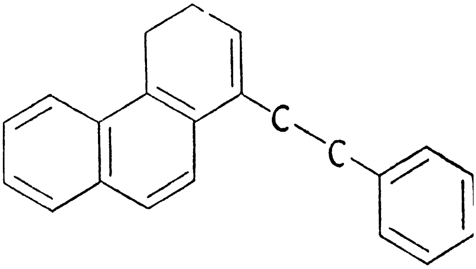
4-Phenethyl-1,2-dihydrophenanthrene



B. P., °C @ 760mm
180 0.01[3]

n_D^{20}
1.6510 26° [3]

1-Phenethyl-3,4-dihydrophenanthrene

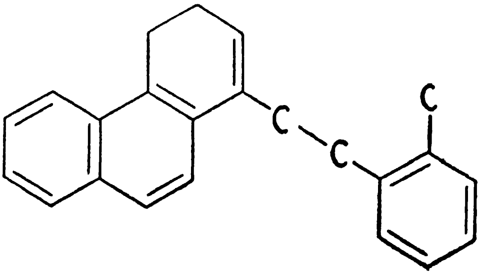


M. P., °C
62-63[8]

B. P., °C @ 760mm
185-187 0.5-1[8]

$C_{23}H_{22}$

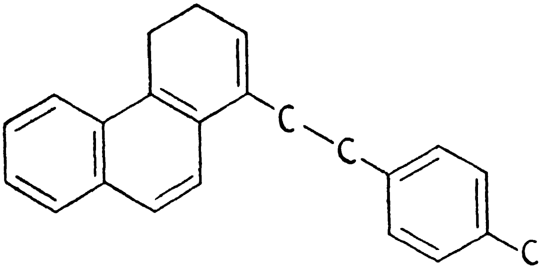
1-*o*-Tolyl-2-[1′-(3′,4′-dihydrophenanthryl)]-ethane



M. P., °C
57–58[8]

B. P., °C @ 760mm
190–195 0.5–1[8]

1-*p*-Tolyl-2-[1′-(3′,4′-dihydrophenanthryl)]-ethane

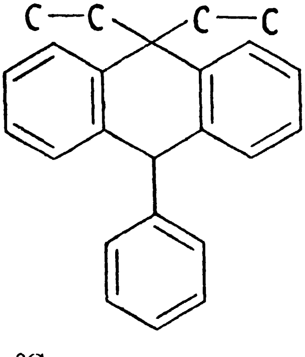


M. P., °C
79.5–81[8]

B. P., °C @ 760mm
200–205 0.5–1.0[8]

$C_{24}H_{24}$

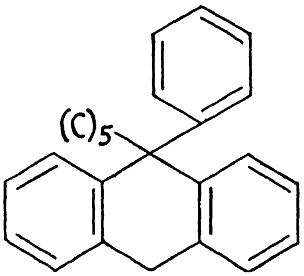
9,9-Diethyl-10-phenyl-9,10-dihydroanthracene



M. P., °C
135–136[13]

$C_{25}H_{26}$

9-Pentyl-9-phenyl-9,10-dihydroanthracene



M. P., °C
85[12]

References on Dihydroanthracenes and Dihydrophenanthrenes with One Phenyl Substitution

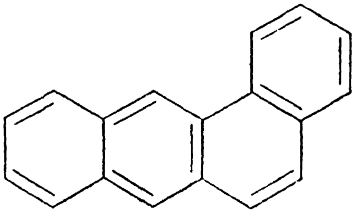
1. Bach, C., Ber. **23,** 2527 **1890.**
2. Bachmann, W. E., and A. L. Wilds, J. Am. Chem. Soc. **60,** 624 **1938.**
3. Bergmann, E., J. Chem. Soc. **1938,** 1291.
4. Bergmann, E., and F. Bergmann, J. Am. Chem. Soc. **59,** 1443 **1937.**
5. Bradsher, C. K., and E. S. Smith, J. Am. Chem. Soc. **65,** 1643 **1943.**
6. Cook, J. W., J. Chem. Soc. **1926,** 1677.

7. Cook, J. W., J. Chem. Soc. **1926,** 2160.
8. Drake, N. L., and W. C. McVey, J. Org. Chem. **4,** 464 **1939.**
9. Dufraisse, C., L. Velluz, and Mme. L. Velluz, Bull. soc. chim. [5] **5,** 1073 **1938.**
10. Earl, J. C., and C. H. Wilson, J. Proc. Roy. Soc. N. S. Wales **65,** 178 **1931.**
11. Haack, E., Ber. **62,** 1771 **1929.**
12. Jüngermann, E., Ber. **38,** 2868 **1905.**
13. Kehrmann, F., R. Monier, and M. Ramm, Ber. **56,** 169 **1923.**
14. Newman, M. S , J. Org. Chem. **9,** 518 **1944.**
15. Schlenk, W., and E. Bergmann, Ann. **463,** 1 **1928.**
16. Scholl, R., and W. Neovius, Ber. **44,** 1075 **1911.**
17. von Baeyer, A., and A. Schillinger, Ann. **202,** 51 **1880.**

3. 1,2-BENZOANTHRACENE AND ITS ALKYL DERIVATIVES, C_nH_{2n-24}

$C_{18}H_{12}$

1,2-Benzoanthracene
(Naphthanthracene)

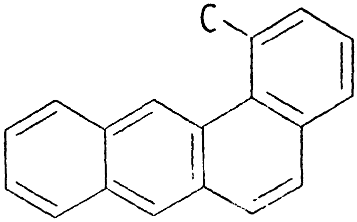


M. P., °C
159.7
165–167[17]
161.4–161.8[21]
160.5–161[24]
160–160.5[30]
159.5–160.5[28]
160[41]
159–160[12, 27, 30]
158–160[38, 42]
158.5–159.5[16]
159[9, 36, 39]
158–159[6, 7, 13, 22]
158–158.5[1]
156–157[10]
155–157[23, 35]

D_4^{20}
1.245 (solid)[37]

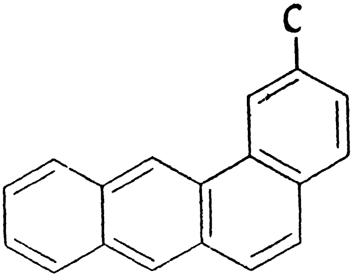
$C_{19}H_{14}$

1,2-(3′-Methylbenzo)-anthracene



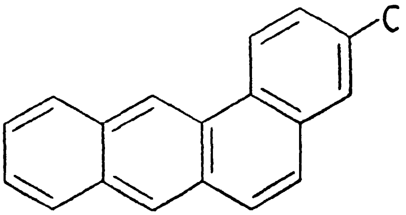
M. P., °C
138.5–139.2[34]
138.5–139.0[21]
135.5–136.5[4]

1,2-(4′-Methylbenzo)-anthracene



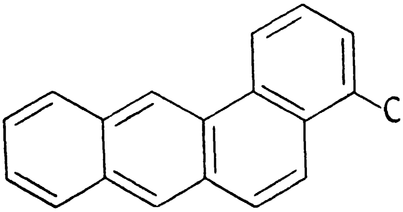
M. P., °C
149–150[13]
148–149[3]

1,2-(5′-Methylbenzo)-anthracene



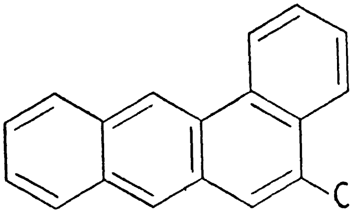
M. P., °C
160[13]

1,2-(6′-Methylbenzo)-anthracene



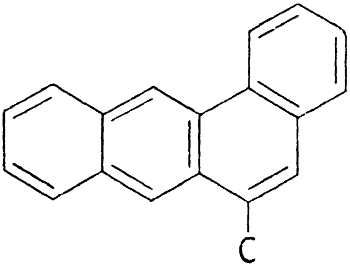
M. P., °C
194–195[19]

1,2-Benzo-3-methylanthracene



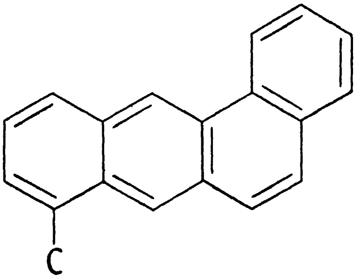
M. P., °C
155[18]
153–154[11]

1,2-Benzo-4-methylanthracene



M. P., °C
124–126[33]
124.5–125.5[14]
124.1–124.6[32]

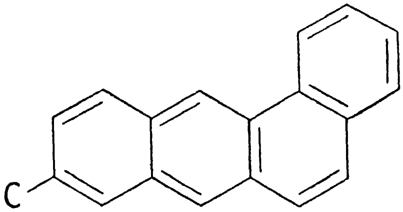
1,2-Benzo-5-methylanthracene



M. P., °C
158
158–159.4[31]
158.5–159.1[33]
157.5–158.5[14]
156.5–157[5]
154–156[23]

D_4^{20}
1.231 (solid)[37]

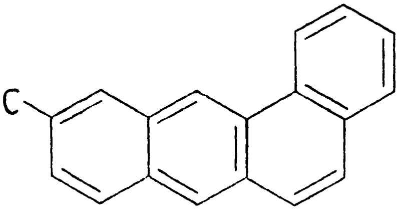
1,2-Benzo-6-methylanthracene



M. P., °C
150.5–151.5[13]
149–151.5[2]
127 (a)[22]

(a) The structural formula indicates that this compound has a *para* bond in the 9,10-position.

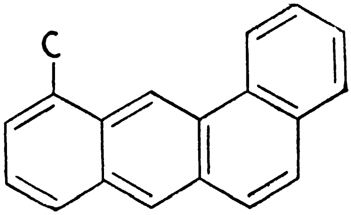
1,2-Benzo-7-methylanthracene



M. P., °C

182[13]
181[20]
179.5–181[2]

1,2-Benzo-8-methylanthracene



M. P., °C

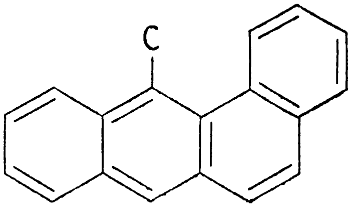
145 (a)[22]
118–118.5 (b)[30]
117–118 (b)[31]
117–118[15]
114–117 (c)[2]

(a) The structural formula indicates that this compound has a *para* bond in the 9,10-position.

(b) This compound remelts at 113.5–114. The substance melting at 113.5–114 is considered a different modification in the literature.

(c) This compound remelts at 112–113.

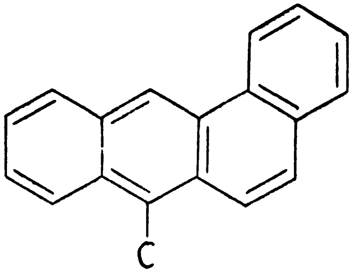
1,2-Benzo-9-methylanthracene



M. P., °C

138.5
138–139[19]
138.4–138.8[25, 40]
138.0–138.8[21]
137.5–138.5[8]

1,2-Benzo-10-methylanthracene



M. P., °C

140.4
140.5–141.5[19]
140–141[29]
140.2–140.8[33]
140.0–140.5[21]
139.5–140.5[26]
139–140[3, 27]

References on $C_{18}H_{12}$ through $C_{19}H_{14}$ Compounds

1. Bachmann, W. E., J. Org. Chem. **1,** 347 **1936–37.**
2. Bachmann, W. E., and J. M. Chemerda, J. Org. Chem. **6,** 36 **1941.**
3. Bachmann, W. E., and G. D. Cortes, J. Am. Chem. Soc. **65,** 1329 **1943.**
4. Bachmann, W. E., and R. O. Edgerton, J. Am. Chem. Soc. **62,** 2550 **1940.**
5. Bachmann, W. E., and A. L. Wilds, J. Am. Chem. Soc. **60,** 624 **1938.**
6. Badger, G. M., and J. W. Cook, J. Chem. Soc. **1939,** 802.
7. Barnett, E. de B., and M. A. Matthews, Chem. News **130,** 339 **1925.**
8. Bradsher, C. K., J. Am. Chem. Soc. **62,** 1077 **1940.**
9. Brass, K., and K. Fanta, Ber. **69,** 1 **1936.**
10. Burger, A., and E. Mosettig, J. Am. Chem. Soc. **59,** 1302 **1937.**
11. Cook, J. W., J. Chem. Soc. **1930,** 1087.
12. Cook, J. W., J. Chem. Soc. **1931,** 2524.
13. Cook, J. W., J. Chem. Soc. **1932,** 456.
14. Cook, J. W., J. Chem. Soc. **1933,** 1592.
15. Cook, J. W., and C. G. M. De Worms, J. Chem. Soc. **1939,** 268.
16. Cook, J. W., C. L. Hewett, and I. Hieger, J. Chem. Soc. **1933,** 395.

17. Cook, J. W., and C. A. Lawrence, J. Chem. Soc. **1937,** 817.

18. Cook, J. W., and A. M. Robinson, J. Chem. Soc. **1938,** 505.

19. Cook, J. W., A. M. Robinson, and F. Goulden, J. Chem. Soc. **1937,** 393.

20. Coulson, E. A., J. Chem. Soc. **1935,** 77.

21. Davis, W. W., M. E. Krahl, and G. H. A. Clowes, J. Am. Chem. Soc. **62,** 3080 **1940.**

22. Dziewoński, K., and E. Ritt, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1927A,** 181.

23. Fieser, L. F., and J. Cason, J. Am. Chem. Soc. **61,** 1740 **1939.**

24. Fieser, L. F., and H. J. Creech, J. Am. Chem. Soc. **61,** 3502 **1939.**

25. Fieser, L. F., M. Fieser, E. B. Hershberg, M. S. Newman, A. M. Seligman, and M. J. Shear, Am. J. Cancer **29,** 260 **1937.**

26. Fieser, L. F., and J. L. Hartwell, J. Am. Chem. Soc. **60,** 2555 **1938.**

27. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **59,** 1028 **1937.**

28. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **59,** 2502 **1937.**

29. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **61,** 1272 **1939.**

30. Fieser, L. F., and W. S. Johnson, J. Am. Chem. Soc. **61,** 168 **1939.**

31. Fieser, L. F., and W. S. Johnson, J. Am. Chem. Soc. **61,** 1647 **1939.**

32. Fieser, L. F., and R. N. Jones, J. Am. Chem. Soc. **60,** 1940 **1938.**

33. Fieser, L. F., and M. S. Newman, J. Am. Chem. Soc. **58,** 2376 **1936.**

34. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **60,** 170 **1938.**

35. Haworth, R. D., and C. R. Mavin, J. Chem. Soc. **1933,** 1012.

36. Hertel, E., and H. W. Bergk, Z. physik. Chem. **33B,** 319 **1936.**

37. Iball, J., Z. Krist. **99A,** 230 **1938;** C. A. **32,** 8236 **1938.**

38. Mayer, F., and T. Oppenheimer, Ber. **51,** 510 **1918.**

39. McVicker, W. H., J K. Marsh, and A. W. Stewart, J. Chem. Soc. **127,** 999 **1925.**

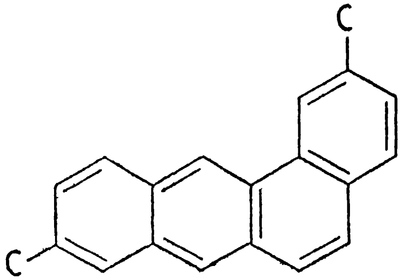
40. Newman, M. S., J. Am. Chem. Soc. **59,** 1003 **1937.**

41. Sturrock, M. G., and T. Lawe, Can. J. Research **17B,** 71 **1939.**

42. Weitzenbock, R., and H. Lieb, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **121,** Abt. IIb, 225 **1912.**

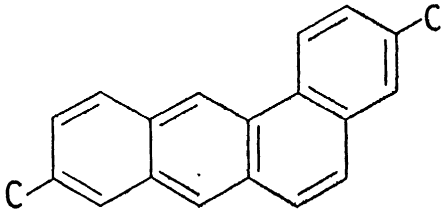
$C_{20}H_{16}$

1,2-(4′-Methylbenzo)-6-methylanthracene



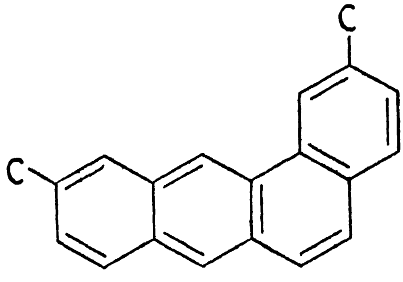
M. P., °C
164[6]

1,2-(5′-Methylbenzo)-6-methylanthracene



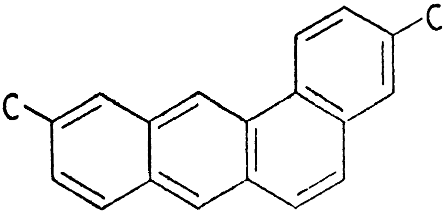
M. P., °C
186–187[6]

1,2-(4′-Methylbenzo)-7-methylanthracene



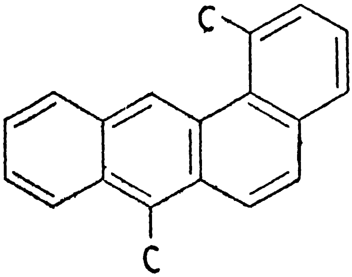
M. P., °C
236[6]

1,2-(5′-Methylbenzo)-7-methylanthracene



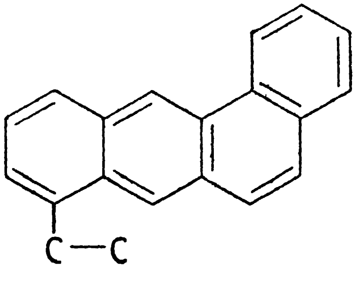
M. P., °C
189–190[6]

1,2-(3′-Methylbenzo)-10-methylanthracene



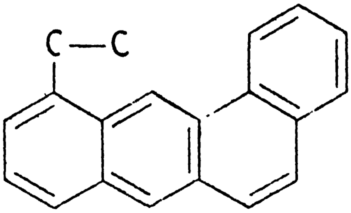
M. P., °C
124–125[21]

1,2-Benzo-5-ethylanthracene



M. P., °C
120[12]
118–119[2]

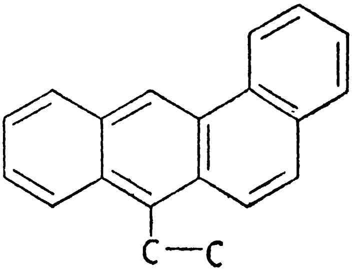
1,2-Benzo-8-ethylanthracene



M. P., °C
78–79 (a)[17]

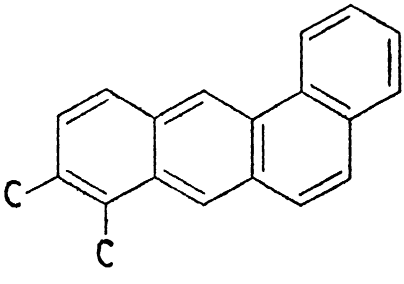
(a) This compound remelts at 82.5–83.

1,2-Benzo-10-ethylanthracene



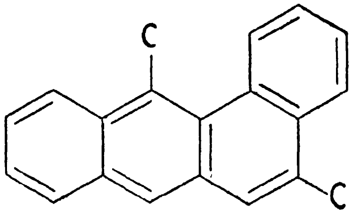
M P., °C
113.5–114[16]
112–113[16]
112.4–112.8[13]

1,2-Benzo-5,6-dimethylanthracene



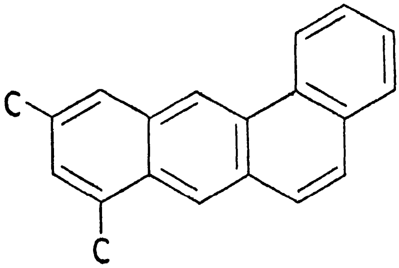
M. P., °C
187–188[8, 9]

1,2-Benzo-3,9-dimethylanthracene



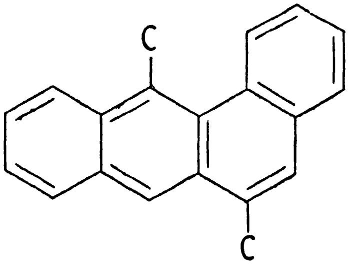
M. P., °C
93–93.5^{22}

1,2-Benzo-5,7-dimethylanthracene



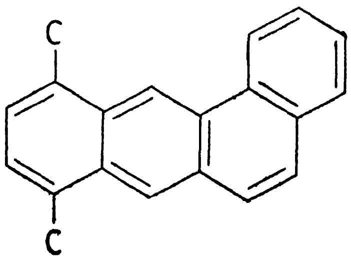
M. P., °C
124.5–125^{3}

1,2-Benzo-4,9-dimethylanthracene



M. P., °C
75.1–75.5^{19}

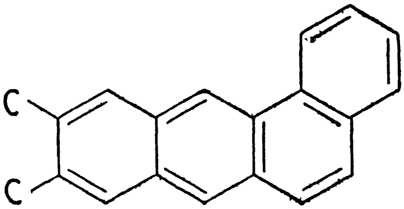
1,2-Benzo-5,8-dimethylanthracene



M. P., °C
133.5–134.5^{3}
131.2–131.4 (a)^{17}

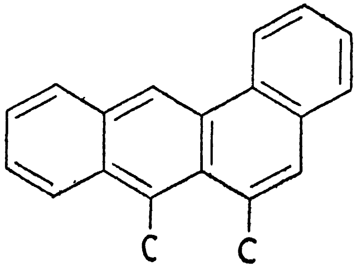
(a) This compound remelts at 134.4–134.7.

1,2-Benzo-6,7-dimethylanthracene



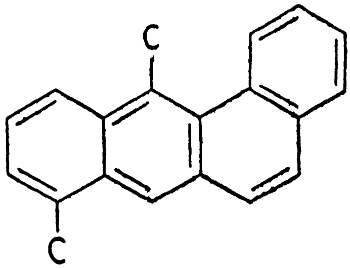
M. P., °C
174^{6}
173–174^{5}

1,2-Benzo-4,10-dimethylanthracene



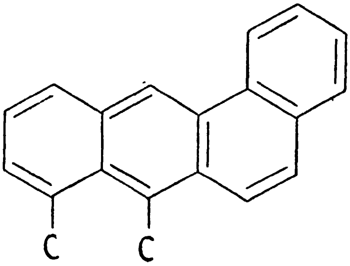
M. P., °C
114–114.4^{19}

1,2-Benzo-5,9-dimethylanthracene



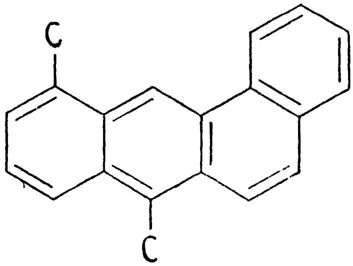
M. P., °C
135.0–135.5^{15}
135–135.5^{25}

1,2-Benzo-5,10-dimethylanthracene



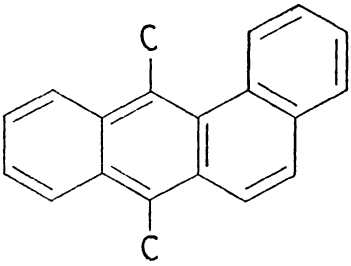
M. P., °C
147–147.5[20]

1,2-Benzo-8,10-dimethylanthracene



M. P., °C
145.5–146.5[17]

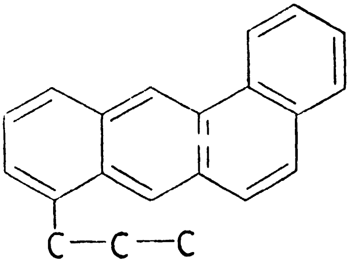
1,2-Dibenzo-9,10-dimethylanthracene



M. P., °C
122–123[1, 2, 24]
122.6–122.9[13]
122.4–122.8[26]

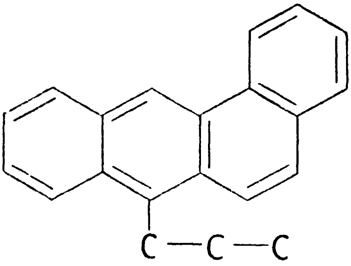
$C_{21}H_{18}$

1,2-Benzo-5-*n*-propylanthracene



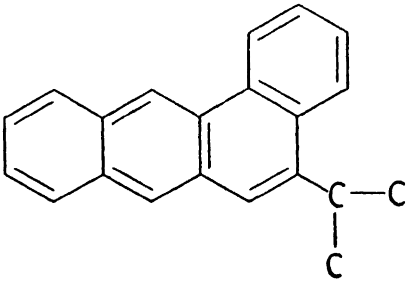
M. P., °C
90–92[2]
91–91.5[10]

1,2-Benzo-10-*n*-propylanthracene



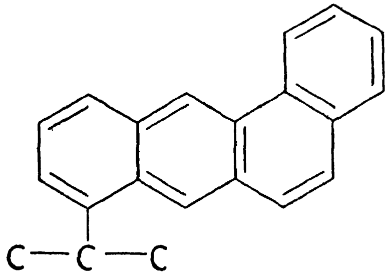
M. P., °C
107–108[16]

1,2-Benzo-3-isopropylanthracene



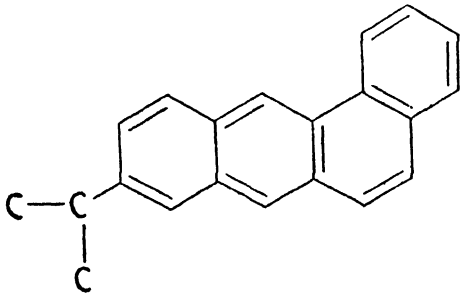
M. P., °C
92[6]

1,2-Benzo-5-isopropylanthracene



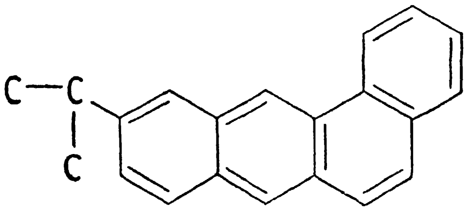
M. P., °C
111-112[8]

1,2-Benzo-6-isopropylanthracene



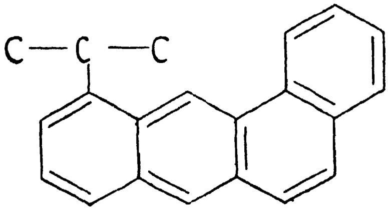
M. P., °C
132-133[7]
131-132[5, 6]

1,2-Benzo-7-isopropylanthracene



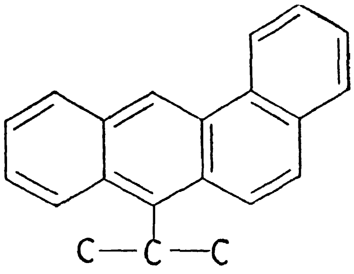
M. P., °C
125[6]

1,2-Benzo-8-isopropylanthracene



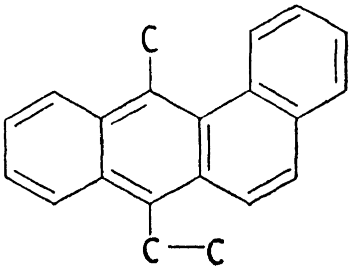
M. P., °C
97-98[18]

1,2-Benzo-10-isopropylanthracene



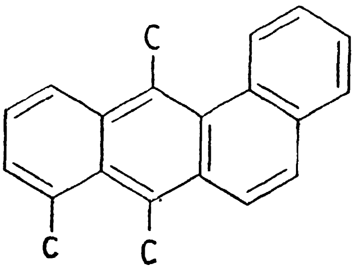
M. P., °C
94-95[6]
93-93.5[16]

1,2-Benzo-9-methyl-10-ethylanthracene



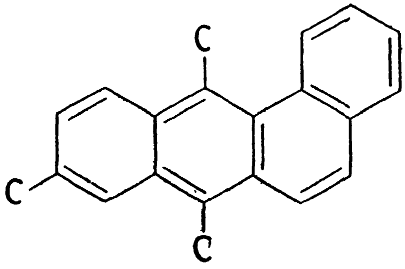
M. P., °C
70-71.5[24]

1,2-Benzo-5,9,10-trimethylanthracene



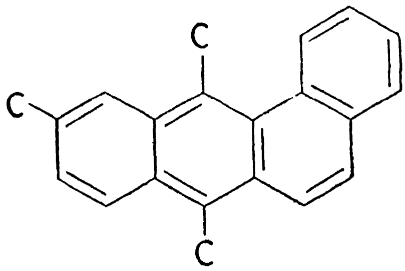
M. P., °C
127-128[1, 23]

1,2-Benzo-6,9,10-trimethylanthracene



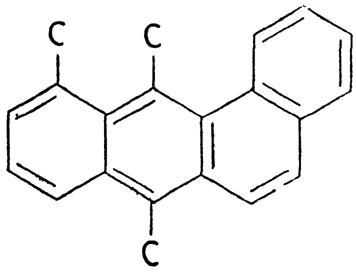
M. P., °C
157–158[4]

1,2-Benzo-7,9,10-trimethylanthracene



M. P., °C
99.5–100[3]

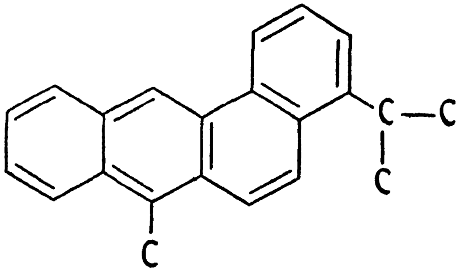
1,2-Benzo-8,9,10-trimethylanthracene



M. P., °C
102–103.5[2]

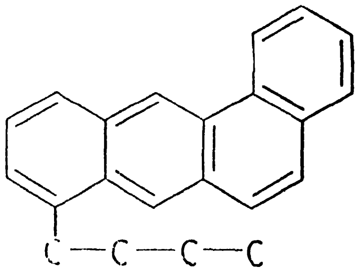
$C_{22}H_{20}$

1,2-(6′-Isopropylbenzo)-10-methylanthracene



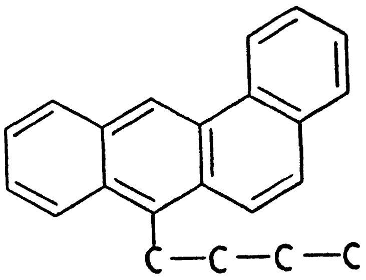
M. P., °C
98–99[14]

1,2-Benzo-5-*n*-butylanthracene



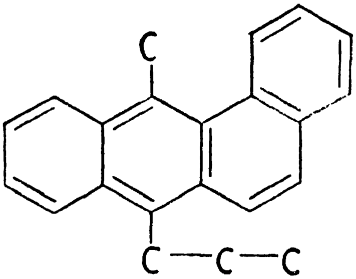
M. P., °C
81[11]

1,2-Benzo-10-*n*-butylanthracene



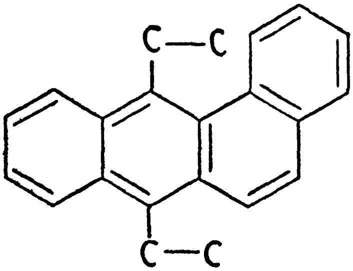
M. P., °C
96.8–97.5[16]
96.4–96.7[18]

1,2-Benzo-9-methyl-10-*n*-propylanthracene



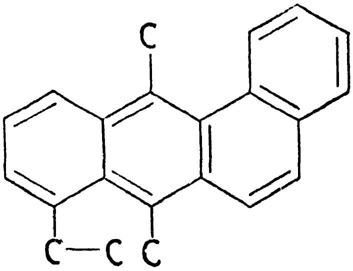
M. P., °C
99–101[24]

1,2-Benzo-9,10-diethylanthracene



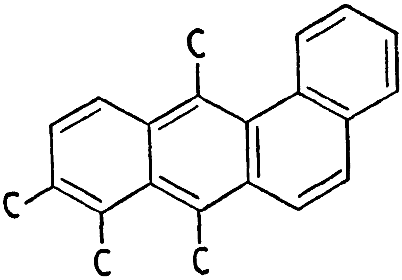
M. P., °C
98.5–99.5[1]

1,2-Benzo-5-ethyl-9,10-dimethylanthracene



M. P., °C
107–108[2]

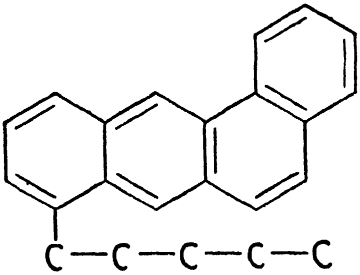
1,2-Benzo-5,6,9,10-tetramethylanthracene



M. P., °C
132–133[4]

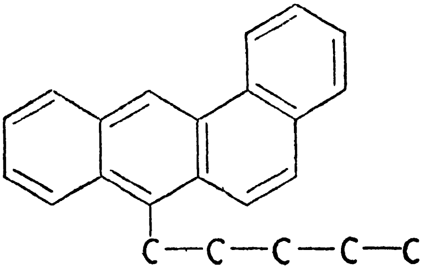
$C_{23}H_{22}$

1,2-Benzo-5-*n*-pentylanthracene



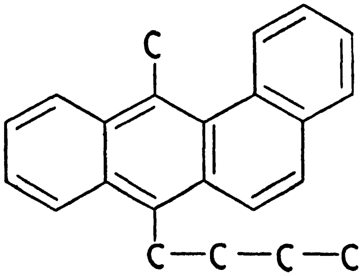
M. P., °C
93[11]

1,2-Benzo-10-*n*-pentylanthracene



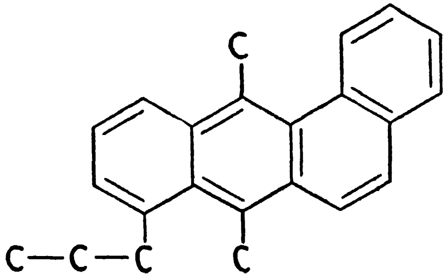
M. P., °C
82.5–83.5[16]
82.6–83.3[13]

1,2-Benzo-9-methyl-10-*n*-butylanthracene



M. P., °C
71–72[24]

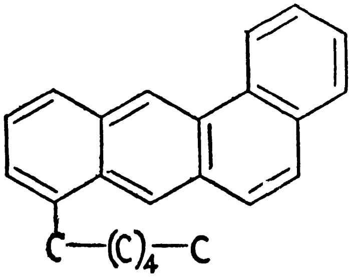
1,2-Benzo-5-*n*-propyl-9,10-dimethylanthracene



M. P., °C
84–85[2]

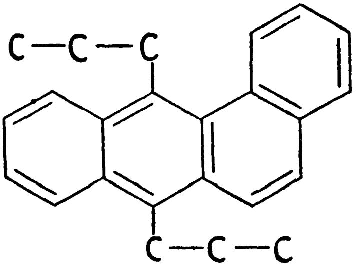
$C_{24}H_{24}$

1,2-Benzo-5-*n*-hexylanthracene



M. P., °C
72–73[11]

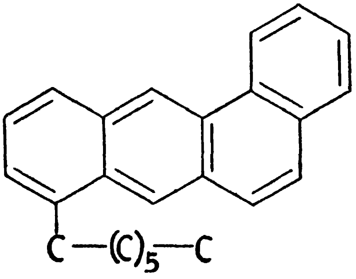
1,2-Benzo-9,10-di-*n*-propylanthracene



M. P., °C
100.5–101[2]

$C_{25}H_{26}$

1,2-Benzo-5-*n*-heptylanthracene



M. P., °C
68[11]

References on $C_{20}H_{16}$ through $C_{25}H_{26}$ Compounds

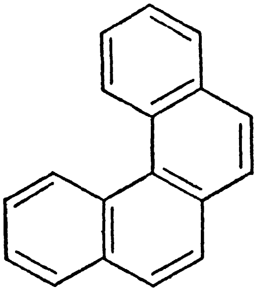
1. Bachmann, W. E., and J. M. Chemerda, J. Am. Chem. Soc. **60,** 1023 **1938.**
2. Bachmann, W. E., and J. M. Chemerda, J. Am. Chem. Soc. **61,** 2358 **1939.**
3. Bachmann, W. E., and J. M. Chemerda, J. Org. Chem. **6,** 36 **1941.**
4. Badger, G. M., J. W. Cook, and F. Goulden, J. Chem. Soc. **1940,** 16.
5. Barry, G., J. W. Cook, G. A. D. Haslewood, C. L. Hewett, I. Hieger, and E. L. Kennaway, Proc. Roy. Soc. (London) **117B,** 318 **1935.**
6. Cook, J. W., J. Chem. Soc. **1932,** 456.
7. Cook, J. W., Proc. Roy. Soc. (London) **111B,** 485 **1932.**

8. Cook, J. W., and C. G. M. DeWorms, J. Chem. Soc. **1939,** 268.
9. Cook, J. W., and G. A. D. Haslewood, J. Chem. Soc. **1934,** 428.
10. Cook, J. W., and G. A. D. Haslewood, J. Chem. Soc. **1935,** 767.
11. Cook, J. W., and A. M. Robinson, J. Chem. Soc. **1940,** 303.
12. Cook, J. W., A. M. Robinson, and F. Goulden, J. Chem. Soc. **1937,** 393.
13. Davis, W. W., M. E. Krahl, and G. H. A. Clowes, J. Am. Chem. Soc. **62,** 3080 **1940.**
14. Fieser, L. F., and R. C. Clapp, J. Am. Chem. Soc. **63,** 319 **1941.**
15. Fieser, L. F., M. Fieser, E. B. Hershberg, M. S. Newman, A. M. Seligman, and M. J. Shear, Am. J. Cancer **29,** 260 **1937.**
16. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **59,** 1028 **1937.**
17. Fieser, L. F., and W. S. Johnson, J. Am. Chem. Soc. **61,** 1647 **1939.**
18. Fieser, L. F., and W. S. Johnson, J. Am. Chem. Soc. **62,** 575 **1940.**
19. Fieser, L. F., and R. Jones, J. Am. Chem. Soc. **60,** 1940 **1938.**
20. Fieser, L. F., and M. S. Newman, J. Am. Chem. Soc. **58,** 2376 **1936.**
21. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **60,** 170 **1938.**
22. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **61,** 136 **1939.**
23. Hartwell, J. L., and H. L. Stewart, J. Natl. Cancer Inst. **3,** 277 **1942.**
24. Mikhailov, B. M., and N. G. Černova, Compt. rend. acad. sci. (U.R.S.S.) **20,** 579 **1938.**
25. Newman, M. S., J. Am. Chem. Soc. **59,** 1003 **1937.**
26. Newman, M. S., J. Am. Chem. Soc. **60** 1141 **1938.**

4. 3,4-BENZOPHENANTHRENE AND ITS ALKYL DERIVATIVES, C_nH_{2n-24}

$C_{18}H_{12}$

3,4-Benzophenanthrene



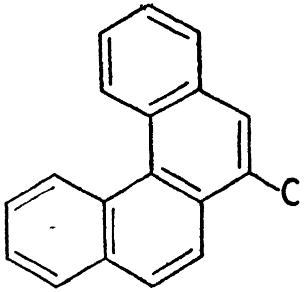
M. P., °C

68^2

$65.6–66.2^8$

$C_{19}H_{14}$

3,4-Benzo-1-methylphenanthrene



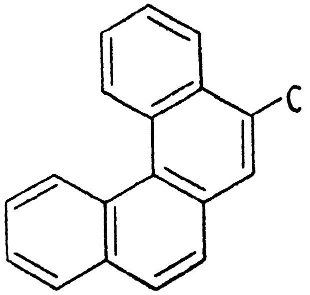
M. P., °C

$77–78^7$

B. P., °C @ 760mm

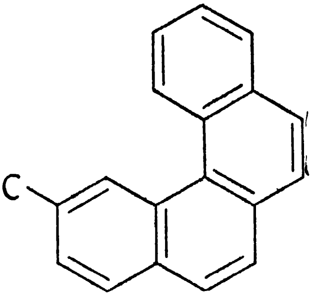
210 0.4^7

3,4-Benzo-2-methylphenanthrene



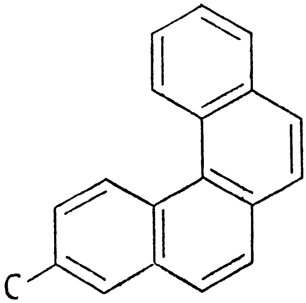
M. P., °C
69.5–70[5]

3,4-Benzo-6-methylphenanthrene



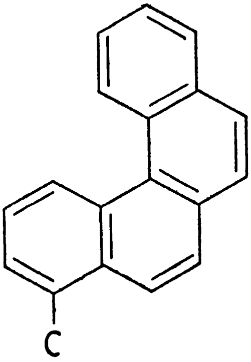
M. P., °C
80–81[6]

3,4-Benzo-7-methylphenanthrene



M. P., °C
54–54.5[6]

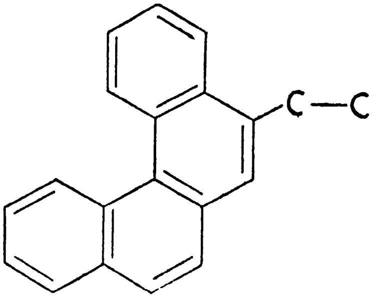
3,4-Benzo-8-methylphenanthrene



M. P., °C
65–66[6]

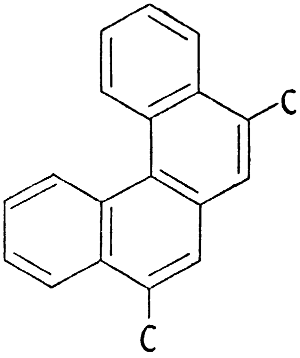
$C_{20}H_{16}$

3,4-Benzo-2-ethylphenanthrene



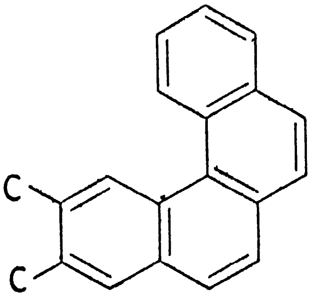
M. P., °C
50.4–51.2[9]

3,4-Benzo-2,9-dimethylphenanthrene



M. P., °C
130.6–131.0[8]

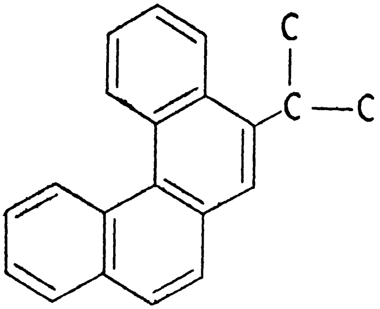
3,4-Benzo-6,7-dimethylphenanthrene



M. P., °C
94.5–95.0[4]
94.5–95[8]

$C_{21}H_{18}$

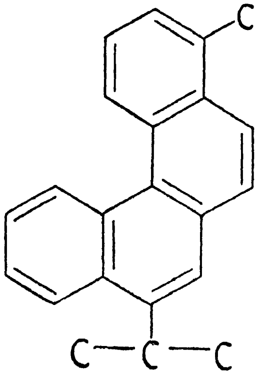
3,4-Benzo-2-isopropylphenanthrene



M. P., °C
91.5–92.5[7]

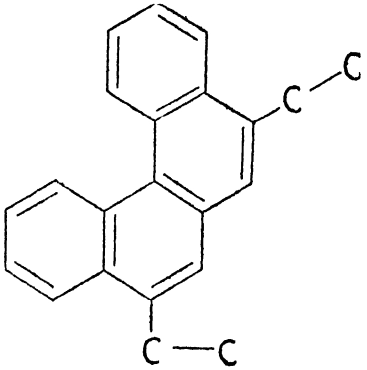
$C_{22}H_{20}$

3,4-(6′-Methylbenzo)-9-isopropylphenanthrene



M. P., °C
98–99[1]

3,4-Benzo-2,9-diethylphenanthrene



M. P., °C
106.4–107.0[8]

References on 3,4-Benzophenanthrene and Its Alkyl Derivatives

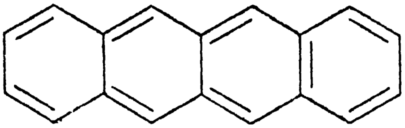
1. Adelson, D. E., and M. T. Bogert, J. Am. Chem. Soc. **59,** 1776 **1937.**
2. Cook, J. W., J. Chem. Soc. **1931,** 2524.
3. Fieser, L. F., M. Fieser, and E. B. Hershberg, J. Am. Chem. Soc. **58,** 1463 **1936.**
4. Fieser, L. F., M. Fieser, E. B. Hershberg, H. L. Holmes, and M. S. Newman, Science [N.S.] **83,** 558 **1936.**
5. Hewett, C. L., J. Chem. Soc. **1936,** 596.
6. Hewett, C. L., J. Chem. Soc. **1938,** 1286.
7. Hewett, C. L., J. Chem. Soc. **1940,** 293.
8. Newman, M. S., and L. M. Joshel, J. Am. Chem. Soc. **60,** 485 **1938.**
9. Newman, M. S., and L. M. Joshel, J. Am. Chem. Soc. **62,** 972 **1940.**

5. NAPHTHACENE AND ITS ALKYL DERIVATIVES, C_nH_{2n-24}

$C_{18}H_{12}$

Naphthacene

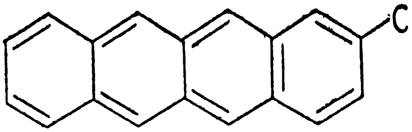
(Tetracene)
(Chrysogene)
(Rubene)



M. P., °C
343
357[3, 8]
349[12]
341.5–343.0[7]
341[1, 2]
337[14, 15]
335–336[9]
335[11, 13]

$C_{19}H_{14}$

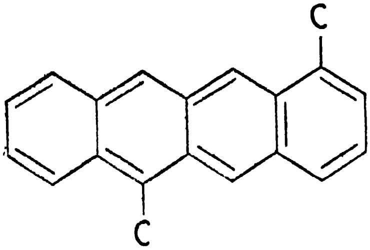
2-Methylnaphthacene



M. P., °C
350[6]

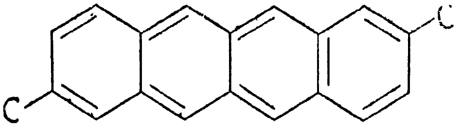
$C_{20}H_{16}$

1,6-Dimethylnaphthacene



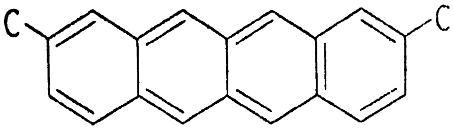
M. P., °C
138 139[10]

2,8-Dimethylnaphthacene



M. P., °C
365[5, 6]

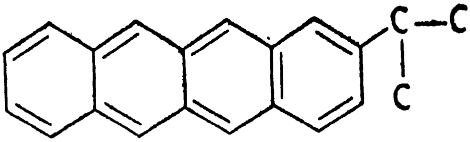
2,9-Dimethylnaphthacene



M. P., °C
362[6]

$C_{21}H_{18}$

2-Isopropylnaphthacene



M. P., °C
273 274[4]

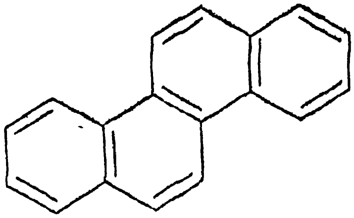
References on Naphthacene and Its Alkyl Derivatives

1. Brass, K., and K. Fanta, Ber. **69**, 1 **1936**.
2. Clar, E., Ber. **65**, 503 **1932**.
3. Clar, E., Ber. **75**, 1271 **1942**.
4. Cook, J. W., J. Chem. Soc. **1934**, 1412.
5. Coulson, E. A., J. Chem. Soc. **1934**, 1406.
6. Coulson, E. A., J. Chem. Soc. **1935**, 77.
7. Davis, W. W., M. E. Krahl, and G. H. A. Clowes, J. Am. Chem. Soc. **62**, 3080 **1940**.
8. Dufraisse, C., and R. Horclois, Bull. soc. chim. [5] **3**, 1880 **1936**.
9. Dziewoński, K., and E. Ritt, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1927A**, 181.
10. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **62**, 49 **1940**.
11. Gabriel, S., and J. Colman, Ber. **33**, 446 **1900**.
12. Hertel, E., and H. W. Bergk, Z. physik. Chem. **33B**, 319 **1936**.
13. Weitzenbock, R., and H. Lieb, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **121**, Abt. IIb, 225 **1912**.
14. Winterstein, A., and K. Schon, Naturwissenschaften **22**, 237 **1934**.
15. Winterstein, A., K. Schön, and H. Vetter, Z. physiol. Chem. **230**, 158 **1934**.

6. CHRYSENE AND ITS ALKYL DERIVATIVES, C_nH_{2n-24}

$C_{18}H_{12}$

Chrysene



M. P., °C

252
255–256[73]
255[61, 66]
254.5–255[8, 12, 25]
254.1–254.4[9]
253.2–254.2[50]
254[37, 46]
253–254[59]
253.2–253.8[20]
252.5[53]
252[57]
251–252[62]
251[71]
250 (a)
249–250[23]
248–250[13, 34]
247.5–249.5[7]
249[24, 74]
248–249[17, 18, 62]
247–249[4]
246–248.5[63]
248[36, 39, 54, 56, 68, 69]
247–248[1, 62]
246–248[21]
247[16]
245[40, 67, 72]

B. P., °C @ 760mm

448[41, 44, 65]
436.0[35]

D_4^{20}

1.273 (solid)[8]
1.274 (solid)[8, 42]

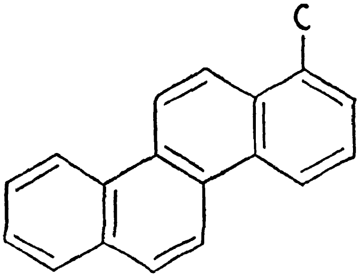
Additional Data

Sublimation Temp. (°C)	
190	20mm[30]
169	in vac.[41]

(a) The melting point 250 is found in references 6, 11, 15, 22, 30, 33, 41, 43, 47, 51, 52, 58, 64, 70, 75.

$C_{19}H_{14}$

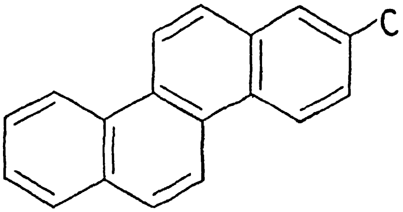
1-Methylchrysene



M. P., °C

249.5–250[5]

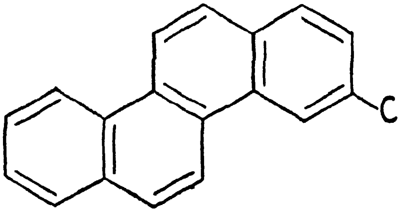
2-Methylchrysene



M. P., °C

229–230[4]

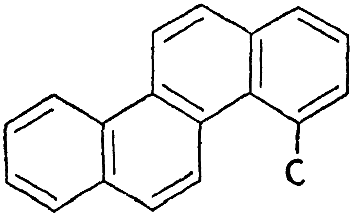
3-Methylchrysene



M. P., °C

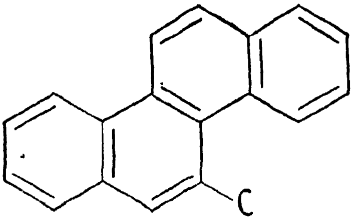
170–170.5[5]

4-Methylchrysene



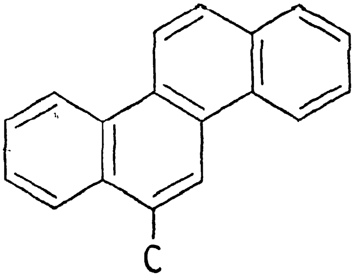
M. P., °C
151–151.5[4, 27]
151[39]
149–149.5[5]

5-Methylchrysene



M. P., °C
117.8
118–118.8[2]
118–118.5[3]
117.3–117.7[20]
116.8–117.6[28]
115–117[49]

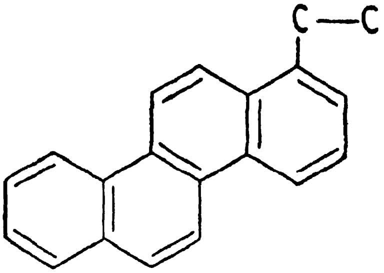
6-Methylchrysene



M. P., °C
160.4
161.0–161.4[48]
160.4–160.9[20]
159–159.8[29]
159.5[14]

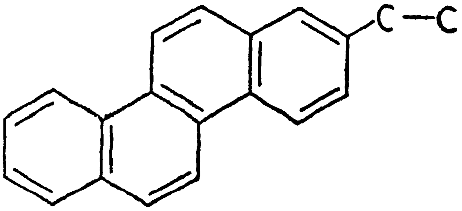
$C_{20}H_{16}$

1-Ethylchrysene



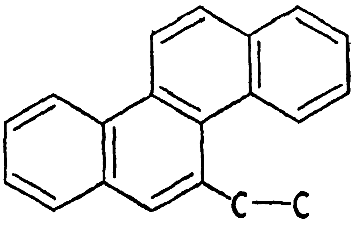
M. P., °C
236[31]
183.5–184[5]

2-Ethylchrysene



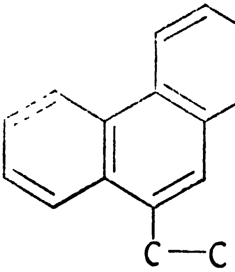
M. P., °C
126[31, 32]

5-Ethylchrysene



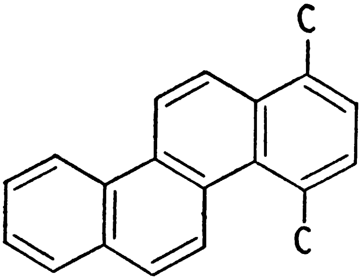
M. P., °C
88–90[49]

6-Ethylchrysene



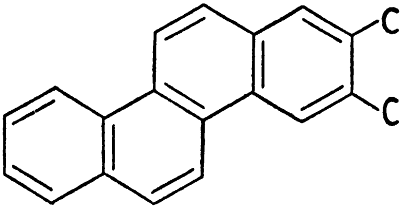
M. P., °C
126.4–126.8[48]

1,4-Dimethylchrysene



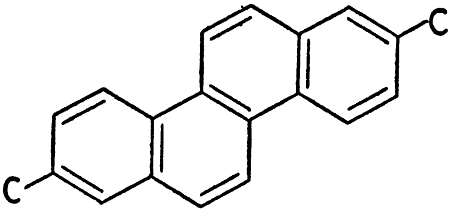
M. P., °C
141.5–142.5[5]

2,3-Dimethylchrysene



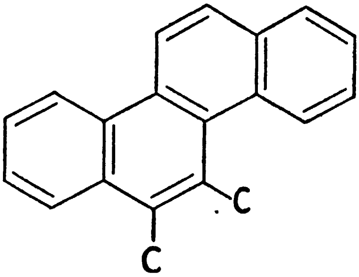
M. P., °C
215–215.3[25]

2,8-Dimethylchrysene



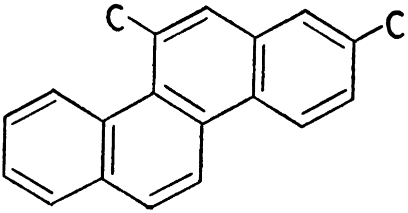
M. P., °C
218[55]

5,6-Dimethylchrysene



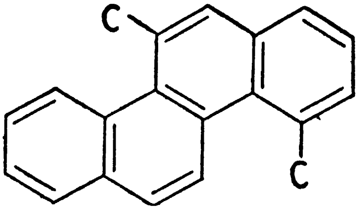
M. P., °C
128.6–129.8[19]
128.5–129.2[20]
127–128[58]

2,11-Dimethylchrysene



M. P., °C
237[45]

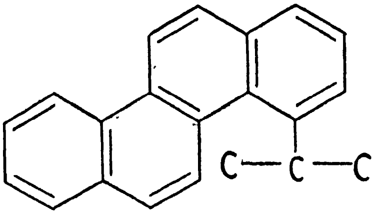
4,11-Dimethylchrysene



M. P., °C
147–147.5[26]

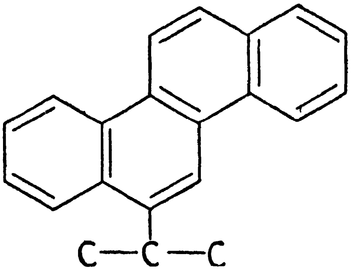
$C_{21}H_{18}$

4-Isopropylchrysene



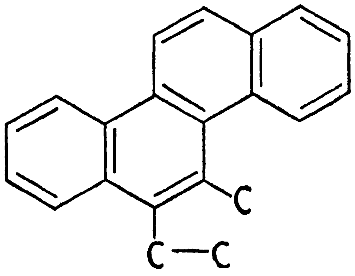
M. P., °C
227[19]

6-Isopropylchrysene



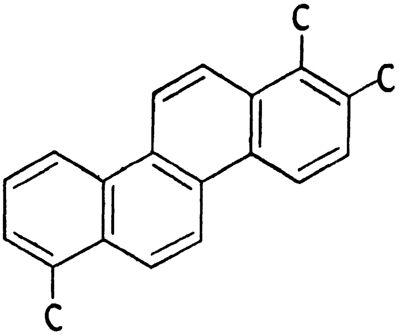
M. P., °C
137[10]

5-Methyl-6-ethylchrysene



M. P., °C
125.5–126.5[14]

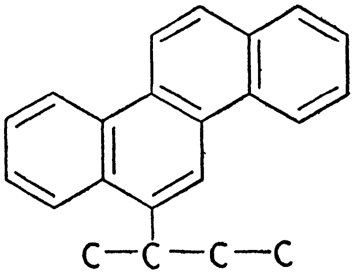
1,2,7-Trimethylchrysene



M. P., °C
281–282[60]

$C_{22}H_{20}$

6-*sec*-Butylchrysene (a)



M. P., °C
100[10]

(a) The structure of this compound was not clearly defined in the literature.

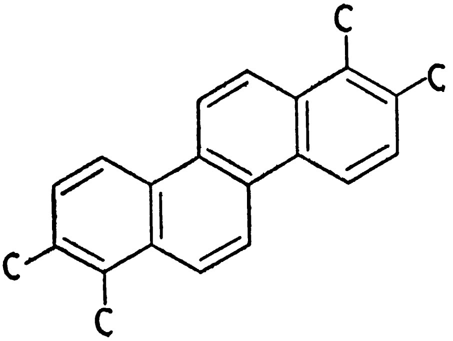
---

x,x-Diethylchrysene (a)

M. P., °C
145[32]

(a) The structure of this compound was not clearly defined in the literature.

1,2,7,8-Tetramethylchrysene



M. P., °C
298–299[60]

References on Chrysene and Its Alkyl Derivatives

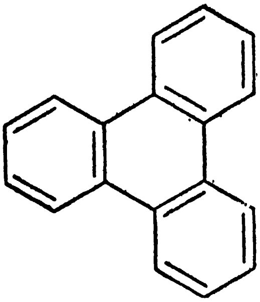
1. Adler, A., Ber. **12,** 1889 **1879.**
2. Bachmann, W. E., and R. O. Edgerton, J. Am. Chem. Soc. **62,** 2550 **1940.**
3. Bachmann, W. E., and S. R. Safir, J. Am. Chem. Soc. **63,** 2601 **1941.**
4. Bachmann, W. E., and W. S. Struve, J. Org. Chem. **4,** 456 **1939.**
5. Bachmann, W. E., and W. S. Struve, J. Org. Chem. **5,** 416 **1940.**
6. Bamberger, E., and F. Chattaway, Ber. **26,** 1745 **1893.**
7. Barry, G., and J. W. Cook, Am. J. Cancer **20,** 58 **1934.**
8. Baxter, G. P., and A. H. Hale, J. Am. Chem. Soc. **58,** 510 **1936.**
9. Baxter, G. P., and A. H. Hale, J. Am. Chem. Soc. **59,** 506 **1937.**
10. Bergmann, F., and H. E. Eschinazi, J. Am. Chem. Soc. **65,** 1413 **1943.**
11. Beschke, E., M. Winograd-Finkel, and G. Köhres, Ann. **384,** 143 **1911.**
12. Bottomley, A. C., and C. C. Twort, Am. J. Cancer **21,** 781 **1934.**
13. Bradley, M. J., and S. W. Parr, Chem. & Met. Eng. **27,** 737 **1922.**
14. Bradsher, C. K., and A. S. Burhans, J. Am. Chem. Soc. **62,** 3140 **1940.**
15. Butenandt, A., and H. Thompson, Ber. **67,** 140 **1934.**
16. Chuang, C.-K., Y.-T. Huang, and C.-M. Ma, Ber. **72,** 713 **1939.**
17. Cook, J. W., and C. L. Hewett, J. Chem. Soc. **1934,** 365.
18. Cook, J. W., C. L. Hewett, and I. Hieger, J. Chem. Soc. **1933,** 395.
19. Cook, J. W., and A. M. Robinson, J. Chem. Soc. **1938,** 505.
20. Davis, W. W., M. E. Krahl, and G. H. A. Clowes, J. Am. Chem. Soc. **62,** 3080 **1940.**
21. Diels, O., and W. Gadke, Ber. **60,** 140 **1927.**
22. Diels, O., and A. Karstens, Ann. **478,** 129 **1930.**
23. Dieterle, H., and H. Rochelmeyer, Arch. Pharm. **273,** 532 **1935.**
24. Dimroth, K., and E. Stockstrom, Ber. **75,** 180 **1942.**
25. Fieser, L. F., M. Fieser, and E. B. Hershberg, J. Am. Chem. Soc. **58,** 1463 **1936.**
26. Fieser, L. F., M. Fieser, E. B. Hershberg, H. L. Holmes, and M. S. Newman, Science [N.S.] **83,** 558 **1936.**
27. Fieser, L. F., and W. S. Johnson, J. Am. Chem. Soc. **61,** 1647 **1939.**
28. Fieser, L. F., and L. M. Joshel, J. Am. Chem. Soc. **62,** 1211 **1940.**
29. Fieser, L. F., L. M. Joshel, and A. M. Seligman, J. Am. Chem. Soc. **61,** 2134 **1939.**
30. Fischer, F., H. Schrader, and W. Meyer, Ges. Abhandl. Kenntnis Kohle **5,** 413 **1920.**
31. Funke, K., and E. Muller, J. prakt. Chem. [2] **144,** 242 **1936.**
32. Funke, K., and J. Ristic, J. prakt. Chem. [2] **146,** 151 **1936.**
33. Graebe, C., Ann. **163,** 361 **1872.**
34. Graebe, C., Ber. **7,** 782 **1874.**
35. Graebe, C., and J. Walter, Ber. **14,** 175 **1881.**
36. Goldschmiedt, G., and M. von Schmidt, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **83,** Abt. IIb, 7 **1881.**
37. Hansen, C. J., Ber. **42,** 210 **1909.**
38. Hewett, C. L., J. Chem. Soc. **1940,** 293.
39. Jones, W. E., and G. R. Ramage, J. Chem. Soc. **1938,** 1853.
40. Kopp, A., Mon. sci. [3] **8,** 1147 **1878.**
41. Krafft, F., and H. Weiland, Ber. **29,** 2240 **1896.**
42. Krishnan, K. S., and S. Banerjee, Trans. Roy. Soc. (London) **234,** 265 **1935.**
43. Kruber, O., Ber. **57,** 1008 **1924.**

44. Lagerlöf, D., J. prakt. Chem. [2] **98,** 136 **1918.**
45. Lewis, H. J., G. R. Ramage, and R. Robinson, J. Chem. Soc. **1935,** 1412.
46. Meyer, H., Z. angew. Chem. **37,** 796 **1924.**
47. Meyer, R., Ber. **45,** 1609 **1912.**
48. Newman, M. S., J. Am. Chem. Soc. **60,** 2947 **1938.**
49. Newman, M. S., J. Am. Chem. Soc. **62,** 870 **1940.**
50. Newman, M. S., and J. A. Cathcart, J. Org. Chem. **5,** 618 **1940.**
51. Orlov, N. A., and N. D. Likhachev, Ber. **62,** 719 **1929.**
52. Orlov, N. A., and N. D. Likhachev, Ber. **63,** 2179 **1930.**
53. Pascal, P., Bull. soc. chim. [4] **29,** 644 **1921.**
54. Peak, D. A., and R. Robinson, J. Chem. Soc. **1936,** 759.
55. Ramage, G. R., J. Chem. Soc. **1938,** 397.
56. Ramage, G. R., and R. Robinson, J. Chem. Soc. **1933,** 607.
57. Raudnitz, H., F. Petrů, and F. Haurowitz, Z. physiol. Chem. **209,** 103 **1932.**
58. Raudnitz, H., F. Petrů, and A. Stadler, Ber. **66,** 879 **1933.**
59. Ruzicka, L., L. Ehmann, M. W. Goldberg, and H. Hosli, Helv. Chim. Acta **16,** 833 **1933.**
60. Ruzicka, L., A. Grob, and G. Anner, Helv. Chim. Acta **26,** 254 **1943.**
61. Ruzicka, L., and H. Hösli, Helv. Chim. Acta **17,** 470 **1934.**
62. Ruzicka, L., G. Thomann, E. Brandenberger, M. Furter, and M. W. Goldberg, Helv. Chim. Acta **17,** 200 **1934.**
63. Schmid, L., and M. Zentner, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **137,** Abt. IIb, 92 **1928.**
64. Schmidt, E., J. prakt. Chem. [2] **9,** 241 **1874.**
65. Schweitzer, R., Ann. **264,** 193 **1891.**
66. Sturrock, M. G., and T. Lawe, Can. J. Research **17B,** 71 **1939.**
67. Tsukamoto, T., J. Pharm. Soc. Japan **48,** 18 **1928;** Chem. Zentr. **1928,** I, 2408.
68. Versmann, F., Chem. News **30,** 203 **1874.**
69. von Braun, J., and G. Irmisch, Ber. **64,** 2461 **1931.**
70. Weger, M., Z. angew. Chem. **22,** 338 **1909.**
71. Weitzenbock, R., and H. Lieb, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **121,** Abt. IIb, 225 **1912.**
72. Winterstein, A., and K. Schön, Z. physiol. Chem. **230,** 146 **1934.**
73. Winterstein, A., K. Schön, and H. Vetter, Z. physiol. Chem. **230,** 158 **1934.**
74. Zanetti, J. E., and G. Egloff, Ind. Eng. Chem. **9,** 474 **1917.**
75. Zeidler, O., Ann. **191,** 285 **1878.**

7. TRIPHENYLENE AND ITS ALKYL DERIVATIVES, C_nH_{2n-24}

$C_{18}H_{12}$

Triphenylene



M. P., °C

198

200[5]

199[1]

198–198.5[11, 18]

198[4, 12]

197.7–198[17]

197.5–197.9[7]

196.5–197.5[3]

197[16]

196–197[13, 14]

196.5[10]

196[11, 15]

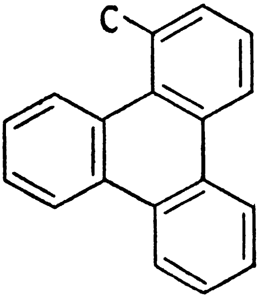
195[6]

B. P., °C @ 760mm

425[1]

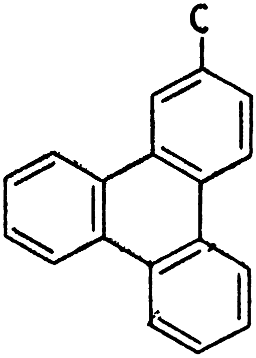
$C_{19}H_{14}$

1-Methyltriphenylene



M. P., °C
93.4–94.2[9]
93–94[3]

2-Methyltriphenylene

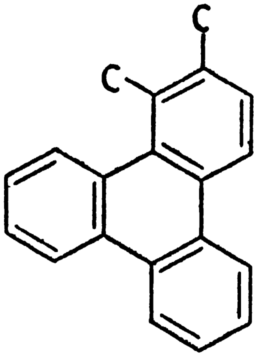


M. P., °C
102.6–103.6[9]
101–102[2]

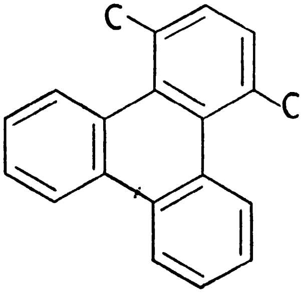
$C_{20}H_{16}$

1,2-Dimethyltriphenylene

M. P., °C
86.8–87.4[9]

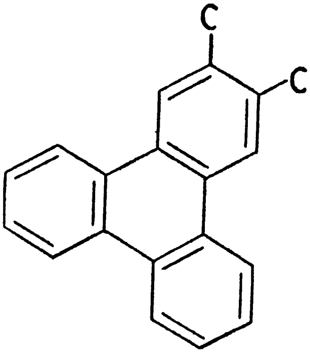


1,4-Dimethyltriphenylene



M. P., °C
108.4–109.2[9]

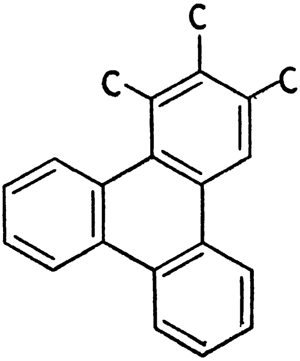
2,3-Dimethyltriphenylene



M. P., °C
156.7–157.2[8]

$C_{21}H_{18}$

1,2,3-Trimethyltriphenylene



M. P., °C
109.8–110.6[8]

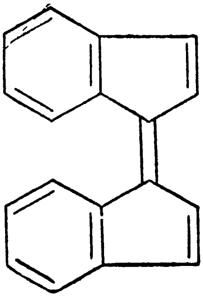
References on Triphenylene and Its Alkyl Derivatives

1. Bachmann, W. E., and H. T. Clarke, J. Am. Chem. Soc. **49,** 2089 **1927.**
2. Bachmann, W. E., and G. D. Cortes, J. Am. Chem. Soc. **65,** 1329 **1943.**
3. Bachmann, W. E., and W. S. Struve, J. Org. Chem. **4,** 472 **1939.**
4. Bergmann, E., and O. Blum-Bergmann, J. Am. Chem. Soc. **59,** 1441 **1937.**
5. Berthelot, Bull. soc. chim. [2] **22,** 437 **1874.**
6. Blum-Bergmann, O., J. Am. Chem. Soc. **60,** 1999 **1938.**
7. Davis, W. W., M. E. Krahl, and G. H. A. Clowes, J. Am. Chem. Soc. **62,** 3080 **1940.**
8. Fieser, L. F., and W. H. Daudt, J. Am. Chem. Soc. **63,** 782 **1941.**
9. Fieser, L. F., and L. M. Joshel, J. Am. Chem. Soc. **61,** 2958 **1938.**
10. Kaffer, H., Ber. **6b,** 1812 **1935.**
11. Mannich, C., Ber. **40,** 159 **1907.**
12. Mohler, H., and J. Sorge, Helv. Chim. Acta **22,** 229 **1939.**
13. Nenitzescu, C. D., and D. Curcăneanu, Ber. **70,** 346 **1937.**
14. Pirrone, F., Gazz. chim. ital. **66,** 244 **1936.**
15. Schmidt, H., and G. Schultz, Ann. **203,** 118 **1880.**
16. Sturrock, M. G., and T. Lawe, Can. J. Research **17B,** 71 **1939.**
17. Ward, J. J., W. R. Kirner, and H. C. Howard, J. Am. Chem. Soc. **67,** 246 **1945.**
18. Weitzenböck, R., and H. Lieb, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **121,** Abt. IIb, 225 **1912.**

8. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-24}

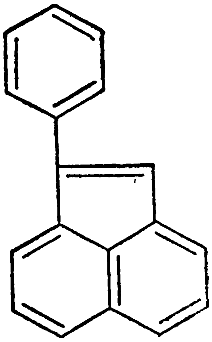
$C_{18}H_{12}$

1,1′-Biindenylidene



M. P., °C
117[37]
115–116[38]

1-Phenylacenaphthylene

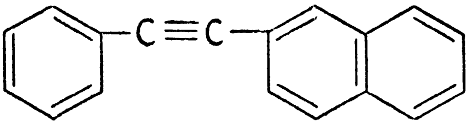


M. P., °C
54–55[33]

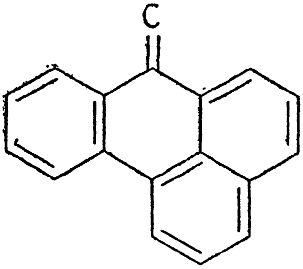
M. P., °C
232–235 (a)[47]

(a) This compound melts with decomposition.

Phenyl-(2-naphthyl)-ethyne



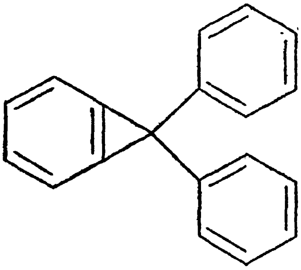
Benzo-[de]-9-methyleneanthracene



M. P., °C
225[13, 14]

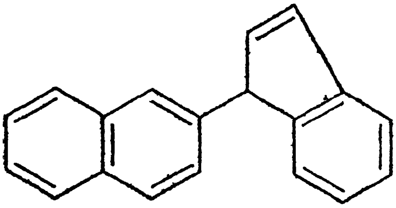
$C_{19}H_{14}$

1,1-Diphenyl-2,3-benzocyclopropane



M. P., °C
144[44, 45]
138[34]

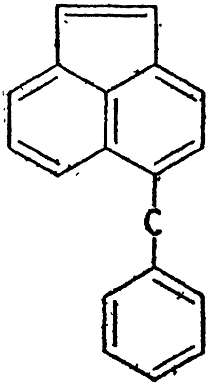
2-(1′-Indenyl)-naphthalene



M. P., °C
88[50]
87[16]

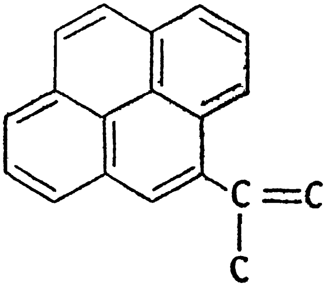
B. P., °C @ 760mm
246–250 14[50]

5-Benzylacenaphthylene



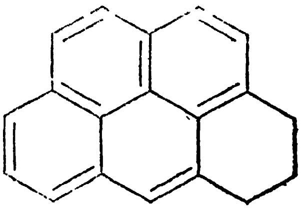
M. P., °C
104–105[20]

3-Isopropenylpyrene



M. P., °C
61.5–62.5[23, 24]

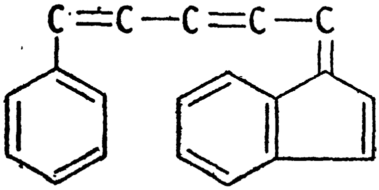
Cyclohexano-[cd]-pyrene



M. P., °C
107–108[48]

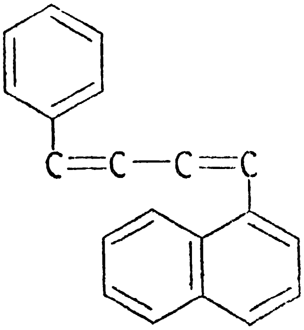
$C_{20}H_{16}$

1-Phenyl-5-(1′-indenylidene)-pentadiene-1,3



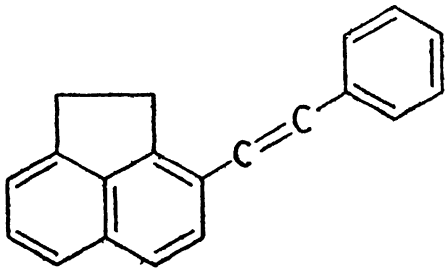
M. P., °C
182–183[1]

1-Phenyl-4-(1′-naphthyl)-butadiene-1,3



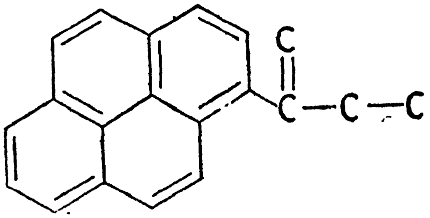
M. P., °C
109[30]

3-Phenethenylacenaphthene



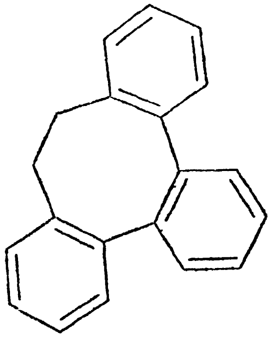
M. P., °C
93.2–94.0[35]

3-(2′-Buten-1′-yl)-pyrene



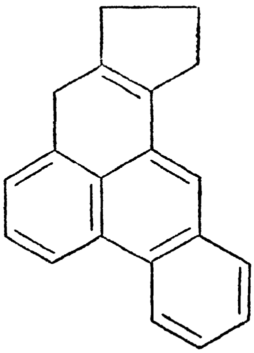
M. P., °C
75-76[25]

1,2,3,4,5,6-Tribenzocyclooctane



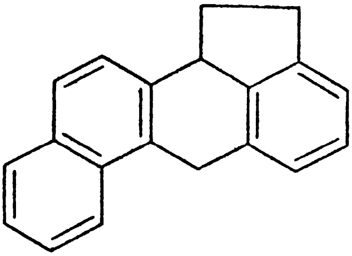
M. P., °C
111-113[46]

2,3-Cyclopentano-5,6-benzophenalene



M. P., °C
144.5–145[29]

6,12b-Dihydrocholanthrene



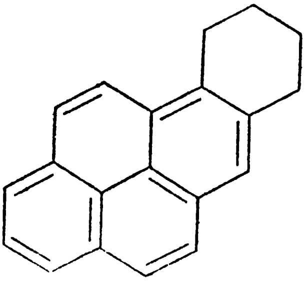
M. P., °C
161.5–162.5[3]

Cyclopentano-[x,x]-x,x-dihydrochrysene (a)

M. P., °C
153.2–153.5[27]

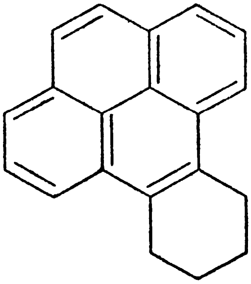
(a) The structure of this compound was not clearly defined in the literature.

1,2-Cyclohexanopyrene



M. P., °C
135[52]
128[36]

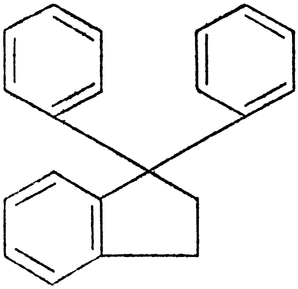
4,5-Cyclohexanopyrene



M. P., °C
113[26]

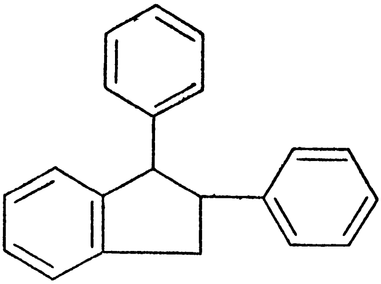
$C_{21}H_{18}$

1,1-Diphenylindane



M. P., °C
67–68[31]
67[32]

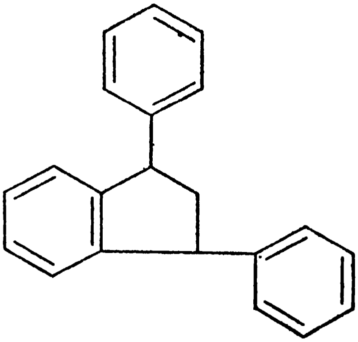
1,2-Diphenylindane



M. P., °C
123–124.5 (a)[8]
89 (a)[8]

(a) These constants were determined on isomeric forms.

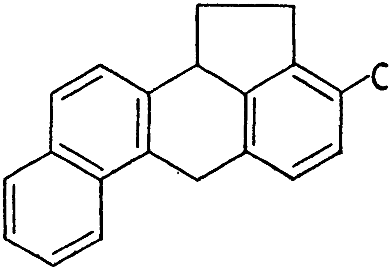
1,3-Diphenylindane



M. P., °C
156–157[41, 54]
155–156[42]

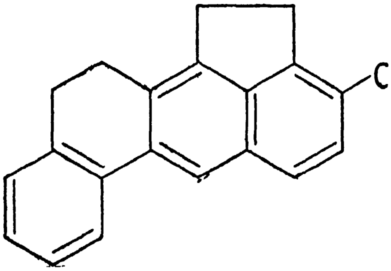
---

meso-3-Methyl-6,12b-dihydrocholanthrene



M. P., °C
138–139[28]

3-Methyl-11,12-dihydrocholanthrene



M. P., °C
154.5–155[28]

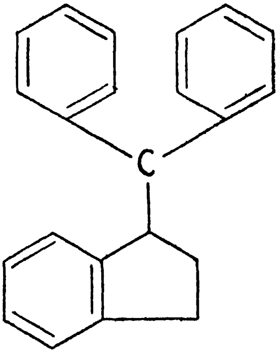
3-Methyl-x,x-dihydrocholanthrene (a)

M. P., °C
136–137[2]

(a) The structure of this compound was not clearly defined in the literature.

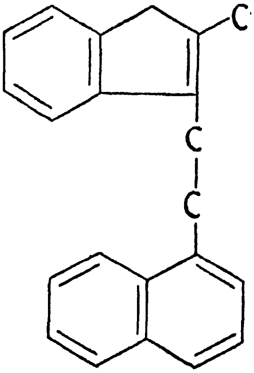
$C_{22}H_{20}$

1-Benzhydrylindane



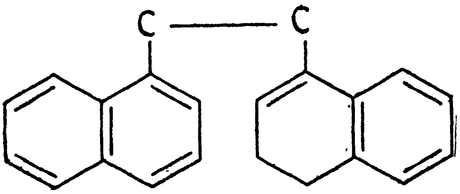
M. P., °C
85–86[18]

1-(1′-Naphthyl)-2-[3″-(2″-methylindenyl)]-ethane



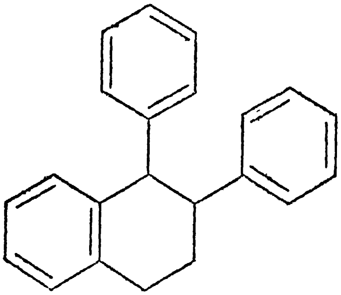
M. P., °C
99–99.5[4]

1-(1′-Naphthyl)-2-[1″-(3″,4″-dihydronaphthyl)]-ethane



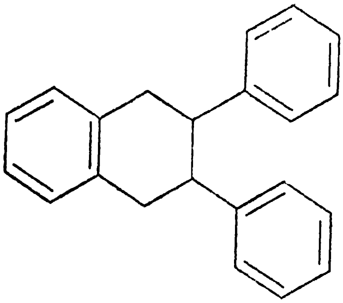
B. P., °C @ 760mm
225–227 1[39]

1,2-Diphenyl-1,2,3,4-tetrahydronaphthalene



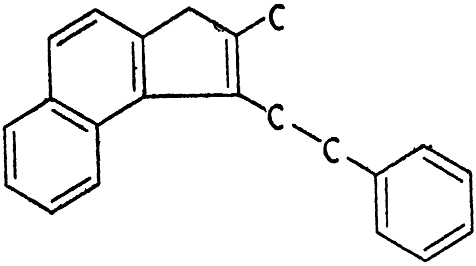
B. P., °C @ 760mm
183–184 1.5[10]

2,3-Diphenyl-1,2,3,4-tetrahydronaphthalene



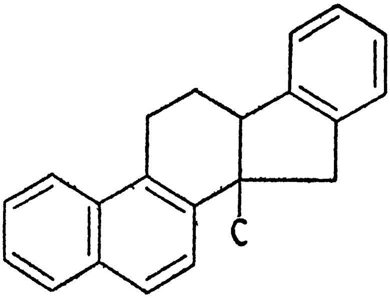
M. P., °C
129–129.5[19]

2-Methyl-3-phenethyl-4,5-benzoindene



B. P., °C @ 760mm
190–195 0.4[15]

1-Methyl-1,2-(2′,3′-indano)-1,2,3,4-tetrahydrophenanthrene



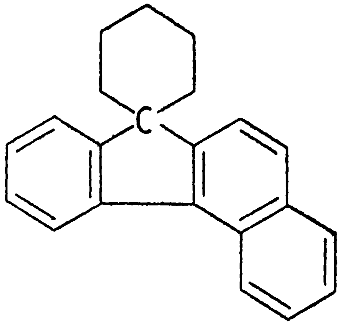
M. P., °C
111–112[4]
B. P., °C @ 760mm
190–195 0.2[4]

Cyclopentano-[hi]-2,3-dimethyl-x,x-dihydrochrysene (a)

M. P., °C
193.5–194.5[27]

(a) The structure of this compound was not clearly defined in the literature.

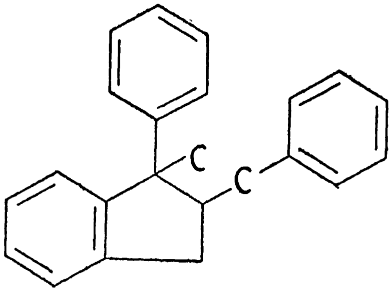
Spiro[3,4-benzofluorene-9,1′-cyclohexane]



B. P., °C @ 760mm
225–230 0.05[9]

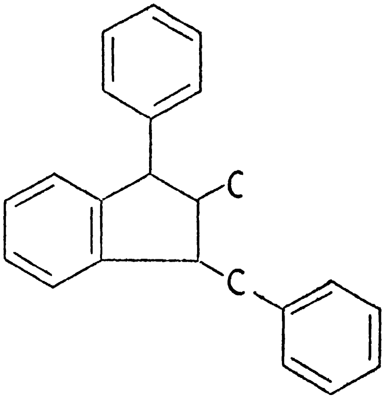
$C_{23}H_{22}$

1-Methyl-1-phenyl-2-benzylindane



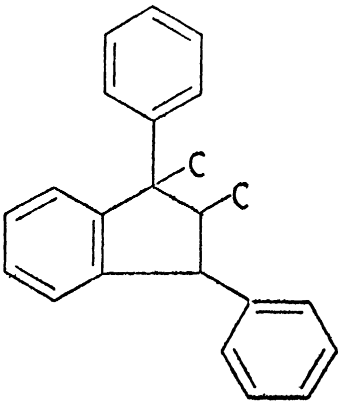
M. P., °C
117–118.5^{11}

1-Phenyl-2-methyl-3-benzylindane



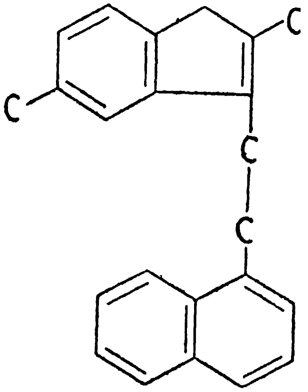
B. P., °C @ 760mm
212–215 16^{8}

1,2-Dimethyl-1,3-diphenylindane



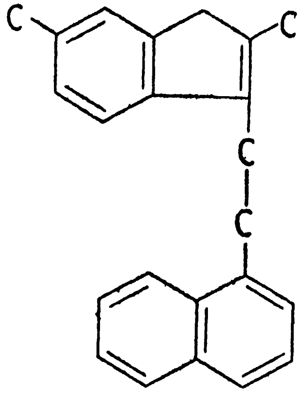
M. P., °C
97.5–98.5^{11}

1-(1′-Naphthyl)-2-[3″-(2″,5″-dimethylindenyl)]-ethane



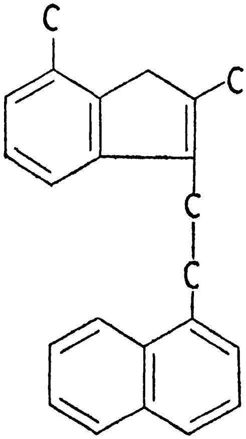
M. P., °C
81–81.5^{4}

1-(1′-Naphthyl)-2-[3″-(2″,6″-dimethylindenyl)]-ethane



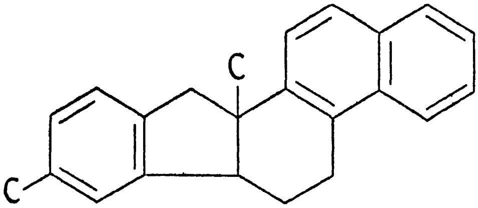
B. P., °C @ 760mm
184–186 0.05^{4}

1-(1′-Naphthyl)-2-[3″-(2″,7″-dimethylindenyl)]-ethane



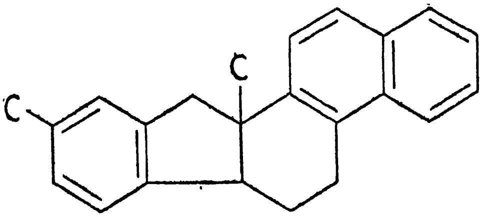
M. P., °C
96[4]

1,2-(2′,1′-Naphtho)-6,9a-dimethyl-3,4,4a,9a-tetrahydrofluorene



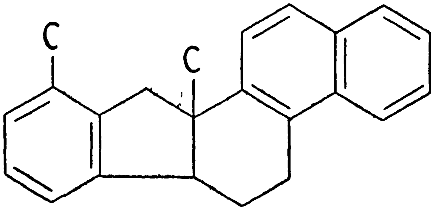
M. P., °C
106.5–107[4]

1,2-(2′,1′-Naphtho)-7,9a-dimethyl-3,4,4a,9a-tetrahydrofluorene



M. P., °C
134.5–135[4]

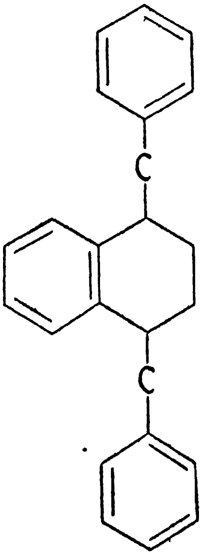
1,2-(2′,1′-Naphtho)-8,9a-dimethyl-3,4,4a,9a-tetrahydrofluorene



M. P., °C
121–122[4]

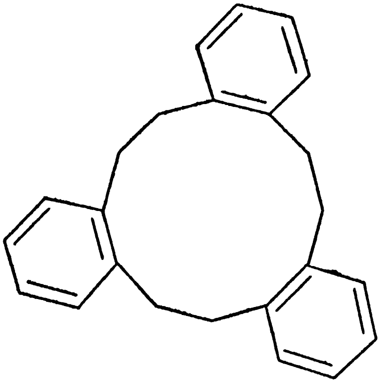
$C_{24}H_{24}$

1,4-Dibenzyl-1,2,3,4-tetrahydronaphthalene



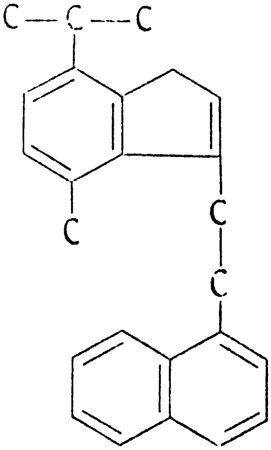
M. P., °C
92–93[21]

1,2,5,6,9,10-Tribenzocyclododecane



M. P., °C
184.5[7]

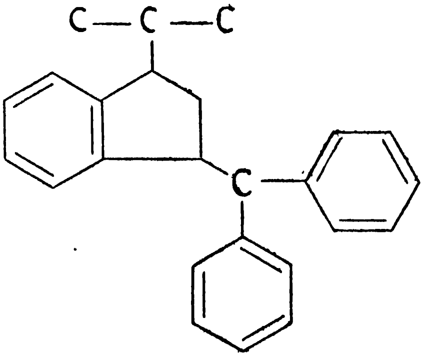
1-(1′-Naphthyl)-2-[3″-(4″-methyl-7″-isopropylindenyl)]-ethane



M. P., °C
92–93[17]

$C_{25}H_{26}$

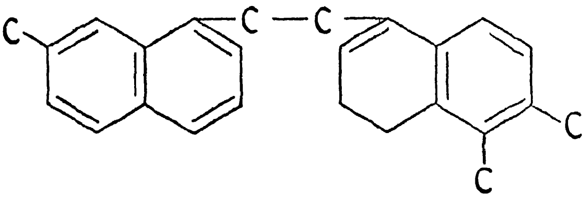
1-Isopropyl-3-benzhydrylindane



M. P., °C
126.5–127.5[53]

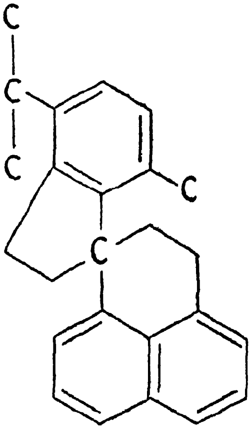
This series continued on next page

1-[1′-(7′-Methylnaphthyl)]-2-[1″-(5″,6″-dimethyl-3″,4″-dihydronaphthyl)]-ethane



B. P., °C @ 760mm
215–217 0.3[40]

Spiro[4-isopropyl-7-methylindane-1, 1′-phenalan] (a)

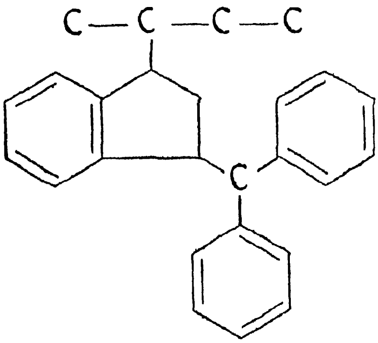


M. P., °C
82–83[17]

(a) The above formula was given for this compound, but the name given in the literature was "7-methyl-4-isopropylhydrindene-1,7′-spiro-7′, 8′-dihydrophenalene."

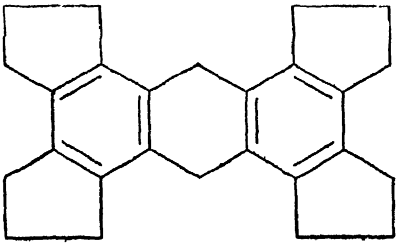
$C_{26}H_{28}$

1-*sec*-Butyl-3-benzhydrylindane



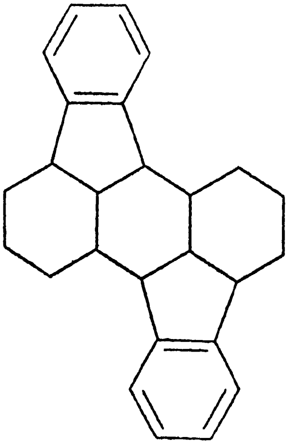
M. P., °C
104–106[53]

1,2,3,4,5,6,7,8-Tetracyclopentano-9,10-dihydroanthracene



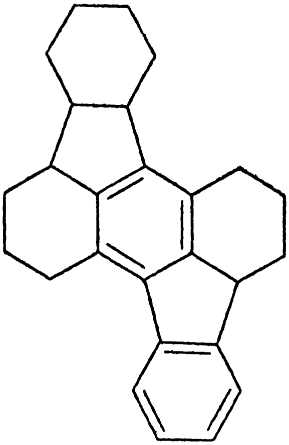
M. P., °C
377–378[6]

Diindano-[3′,2′,1′-de,3″,2″,1″-kl]-tetradecahydroanthracene



M. P., °C
246–248[49]

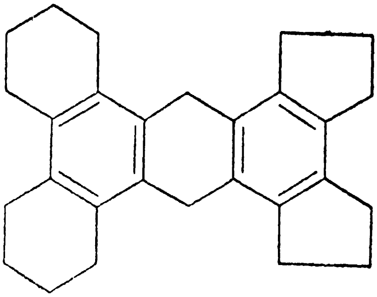
Indo-[1′,2′,3′-de]-(3a″,4″,5″,6″,7″,7a″-hexahydroindo)-[1″,2″,3″-kl]-1,2,3,4,5,6,7,8-octahydroanthracene



M. P., °C
271–273[49]

$C_{28}H_{32}$

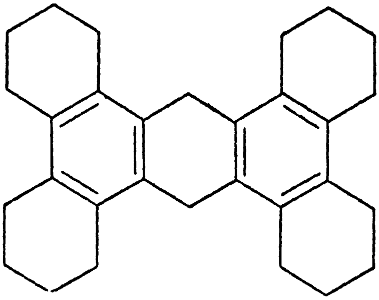
1,2,3,4-Dicyclopentano-5,6,7,8-dicyclohexano-9,10-dihydroanthracene



M. P., °C
333–334[5]

$C_{30}H_{36}$

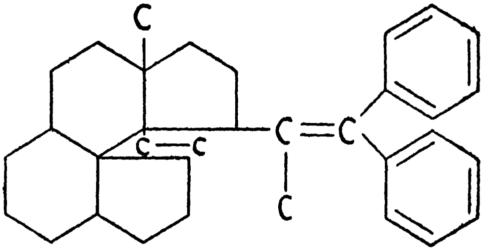
1,2,3,4,5,6,7,8-Tetracyclohexano-9,10-dihydroanthracene



M. P., °C
382–383[6]

$C_{34}H_{44}$

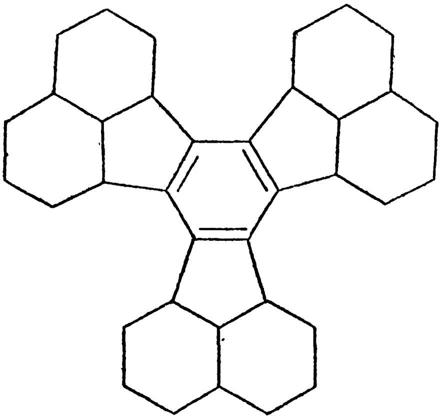
1,1-Diphenyl-2-[3′-(hexahydroindano-[e-7″,7a″]-3a′-ethyl-7a′-methylhexahydroindanyl)]-propene-1



M. P., °C
178[12]

$C_{36}H_{48}$

1,2,3,4,5,6-Tri-[2′,1′-(2a′,3′,4′,5′, 5a′,6′,7′,8′,8a′,8b′-decahydro-acenaphtho)]-benzene



M. P., °C
217–219[51]
215[49]

B. P., °C @ 760mm
360 0.2[19]

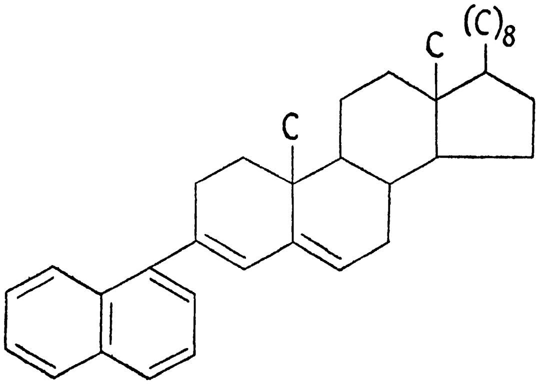
(a) The structures given cholestane and derivatives vary. The above name and structure appear in reference 48.

References on Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-24}

1. Alexa, V., Ber. **64,** 2250 **1931.**
2. Bachmann, W. E., J. Org. Chem. **1,** 347 **1936–37.**
3. Bachmann, W. E , J. Org. Chem. **3,** 434 **1938–39.**
4. Bachmann, W. E., J. W. Cook, C. L. Hewett, and J. Iball, J. Chem. Soc. **1936,** 54.
5. Backer, H. J., and L. H. H. Huisman, Rec. trav. chim. **60,** 557 **1941;** C.A. **37,** 5982 **1943.**
6. Backer, H. J., J. Strating, and L. H. H. Huisman, Rec. trav. chim. **58,** 761 **1939.**
7. Baker, W., R. Banks, D. R. Lyon, and F. G. Mann, J. Chem. Soc. **1945,** 27.
8. Bergmann, E., and H. Weisz, Ann. **480,** 64 **1930.**
9. Bergmann, F., and H. E. Eschinazi, J. Am. Chem Soc. **66,** 183 **1944.**

$C_{37}H_{50}$

3-α-Naphthylcholestadiene (a)



M. P., °C
131–133[48]

Additional Data
$[\alpha]_D^{29} = -49.7°$ [48]

10. Bergmann, F., H. E. Eschinazi, and D. Schapiro, J. Am. Chem. Soc. **64,** 557 **1942.**
11. Blum-Bergmann, O., J. Chem. Soc. **1938,** 723.
12. Butenandt, A., F. Hildebrandt, and H. Brücker, Ber. **64,** 2529 **1931.**
13. Charrier, G., and E. Ghigi, Atti accad. Lincei [6] **16,** 257 **1932.**
14. Charrier, G., and E. Ghigi, Gazz. chim. ital. **62,** 928 **1932.**
15. Cook, J. W., A. Dansi, C. L. Hewett, J. Iball, W. V. Mayneord, and E. Roe, J. Chem. Soc. **1935,** 1319.
16. Cook, J. W., and G. A. D. Haslewood, J. Chem. Soc. **1935,** 770.
17. Cook, J. W., C. L. Hewett, W. V. Mayneord, and E. Roe, J. Chem. Soc. **1934,** 1727
18. Courtot, C., Ann. chim. [9] **5,** 52 **1916.**
19. Crawford, H. M., J. Am. Chem. Soc. **61,** 608 **1939.**
20. Dziewoński, K., and K. Leonhard, Bull. intern. acad polon. sci., Classe sci. math. nat. **1928A,** 99.
21. Dziewoński, K., and J Moszew, Roczniki Chem. **11,** 169 **1931;** C.A. **26,** 131 **1932;** Chem. Zentr. **1931,** I, 2875.
22. Dziewoński, K., J. Moszew, S Lepiankiewicz, and L. Sucheni, Bull. intern. acad polon. sci., Classe sci. math. nat. **1929A,** 950.
23. Dziewoński, K., and L. Sternbach, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1937A,** 81.
24. Dziewoński, K., and L. Sternbach, Roczniki Chem. **17,** 101 **1937;** Chem. Zentr. **1937,** II, 65.
25. Dziewoński, K., and P. Tresiński, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1937A,** 579.
26. Fieser, L. F., and M. Fieser, J. Am. Chem. Soc. **57,** 782 **1935.**
27. Fieser, L. F., M. Fieser, and E. B. Hershberg, J. Am. Chem. Soc. **58,** 1463 **1936.**
28. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **60,** 910 **1938.**
29. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **59,** 883 **1937.**
30. Friedmann, E., and W. E. van Heyningen, J. prakt Chem. [2] **146,** 163 **1936.**
31. Gagnon, P., Ann. chim. [10] **12,** 296 **1929.**
32. Gagnon, P. E., L. Gravel, and L. P. Amiot, Can. J. Research **22B,** 32 **1944.**
33. Ghigi, E., Ber. **73,** 677 **1940.**
34. Hemilian, W., Ber. **7,** 1203 **1874.**
35. Hershberg, E. B., and L. M. Joshel, J. Am. Chem. Soc. **62,** 1305 **1940.**
36. Kon, G. A. R., and E. M. F. Roe, J. Chem. Soc. **1945,** 143.
37. Ruggli, P., and A. Jenny, Helv. Chim. Acta **10,** 228 **1927.**
38. Ruggli, P., and M. Reinert, Helv. Chim. Acta **9,** 67 **1926.**
39. Ruzicka, L., and H. Hosli, Helv. Chim. Acta **17,** 470 **1934.**
40. Ruzicka, L., and E. Mörgeli, Helv. Chim. Acta **19,** 377 **1936.**
41. Schlenk, W., and E. Bergmann, Ann. **479,** 58 **1930.**
42. Schlenk, W., and E. Bergmann, Ann. **479,** 78 **1930.**
43. Scholl, R., and K. Meyer, Ber. **69,** 152 **1936.**
44. Schwartz, H., Ber **14,** 1516 **1881.**
45. Schwarz, H., Bull. soc. chim. [2] **37,** 24 **1882.**
46. Shuttleworth, R G., W. S. Rapson, and E T. Stewart, J. Chem. Soc. **1944,** 71.
47. Straus, F., R. Kuhnel, and R. Haensel, Ber. **66,** 1847 **1933.**
48. Urushibara, Y., T. Ando, H. Araki, and A. Ozawa, Bull. Chem. Soc. Japan **12,** 353 **1937.**
49. von Braun, J., Ber. **67,** 214 **1934.**
50. von Braun, J., G. Manz, and E. Reinsch, Ann. **468,** 277 **1929.**
51. Ward, J. J., W R Kirner, and H. C. Howard, J. Am. Chem. Soc. **67,** 246 **1945.**
52. Winterstein, A., H. Vetter, and K. Schön, Ber. **68,** 1079 **1935.**
53. Wuest, H.-M., Ann. **415,** 291 **1918.**
54. Ziegler, K., H. Grabbe, and F. Ulrich, Ber. **57,** 1983 **1924.**

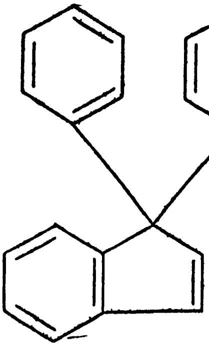
X. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-26}

1. Indene with Two Phenyl Substitutions
2. Binaphthyls, Their Alkyl Derivatives, and Two Naphthyl Substitutions on Alkanes
3. Anthracene and Phenanthrene with One Phenyl Substitution
4. Cholanthrene and Its Alkyl Derivatives
5. Other Benzocyclanoanthracenes, Benzocyclanophenanthrenes, and Their Alkyl Derivatives
6. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-26}

1. INDENE WITH TWO PHENYL SUBSTITUTIONS, C_nH_{2n-26}

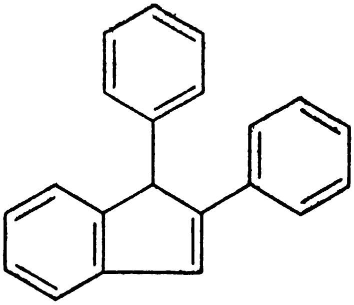
$C_{21}H_{16}$

1,1-Diphenylindene



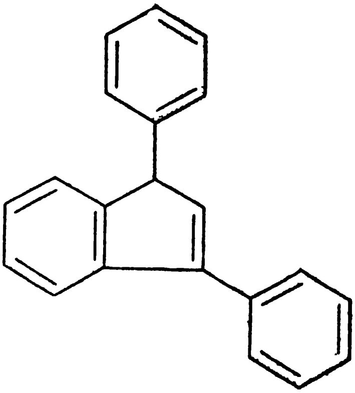
M. P., °C
91–92[13]
90–91[14]

1,2-Diphenylindene



M. P., °C
177
177–178[19, 20, 21]
177[25]
176–177[23, 24]
175[3]
174–175[1]

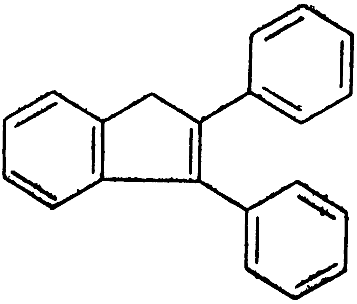
1,3-Diphenylindene



M. P., °C
84–85 (a)[12]
71–72[31]
68–69 (a)[12]
B. P., °C @ 760mm
230 15[31]

(a) These constants were determined on different crystalline forms.

2,3-Diphenylindene

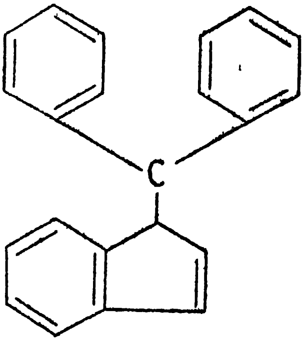


M. P., °C
109.5
111[7]
110[2]

109–110[21]
108–109[20, 29]
108[25]
107–108[23, 24]

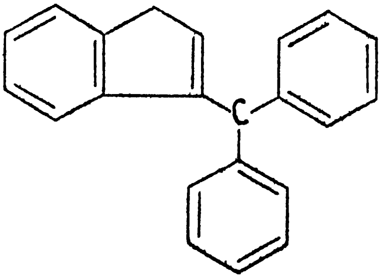
$C_{22}H_{18}$

1-Benzhydrylindene



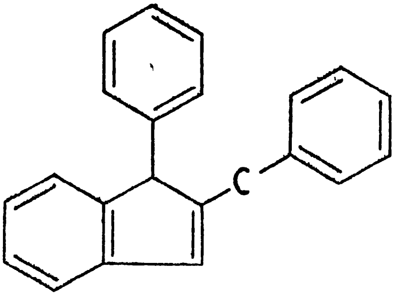
M. P., °C
163–164[6]
161[11]
160–161[10]

3-Benzhydrylindene



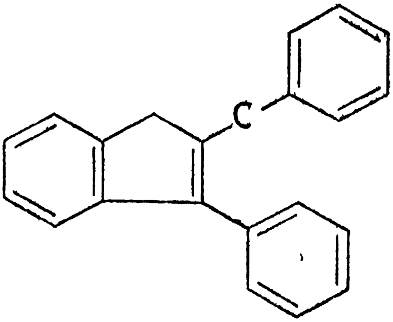
M. P., °C
115–116[10, 11]
114[26]
113–114[6, 28]

1-Phenyl-2-benzylindene



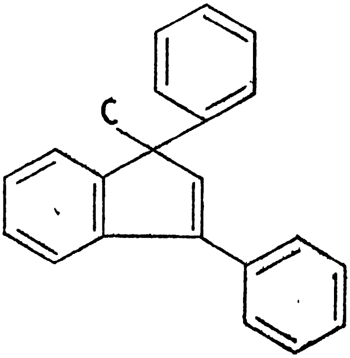
M. P., °C
101[24]
97–99[6]

2-Benzyl-3-phenylindene



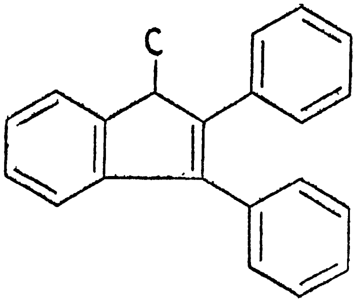
M. P., °C
101[5]
96–98[4, 8]
96–97.5[8]
92–93[22]

1-Methyl-1,3-diphenylindene



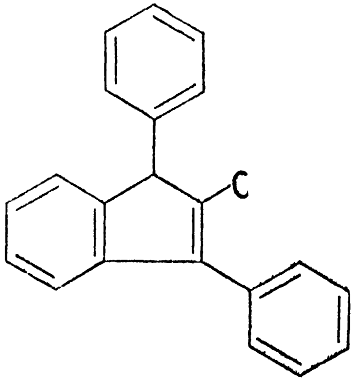
M. P., °C
59–60[16, 17]
B. P., °C @ 760mm
205–210 7[17]

1-Methyl-2,3-diphenylindene



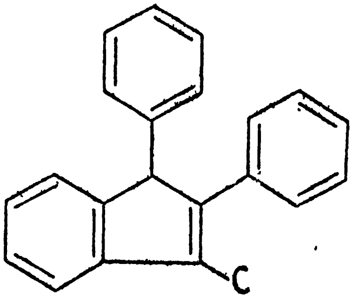
M. P., °C
106.5[17]

1,3-Diphenyl-2-methylindene



M. P., °C
108[15]

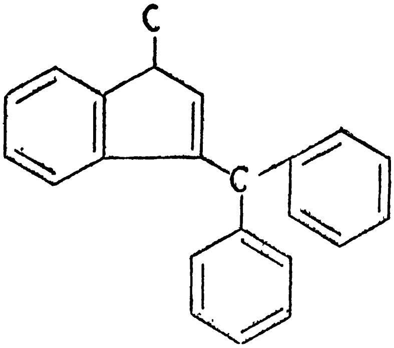
1,2-Diphenyl-3-methylindene



M. P., °C
91[17]

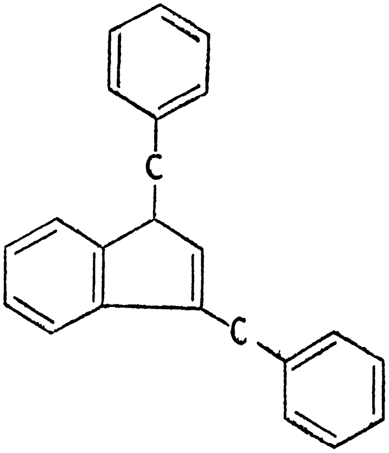
$C_{23}H_{20}$

1-Methyl-3-benzhydrylindene



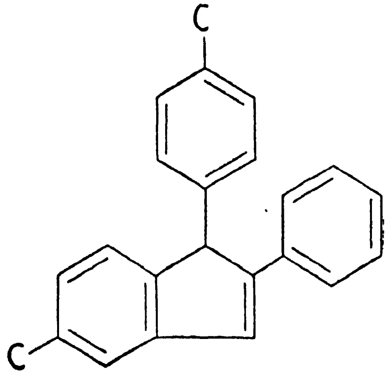
M. P., °C
162.5–163.5[30]

1,3-Dibenzylindene



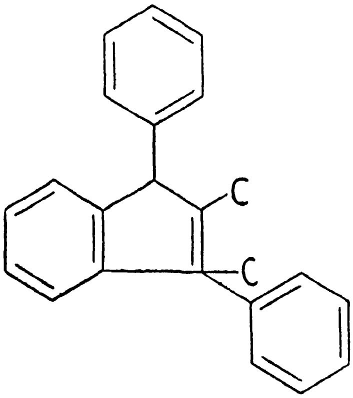
M. P., °C
62–63[27]

1-*p*-Tolyl-2-phenyl-5-methylindene



M. P., °C
145–146[18]

1,3-Diphenyl-2,3-dimethylindene



M. P., °C
68.5–69.5[9]

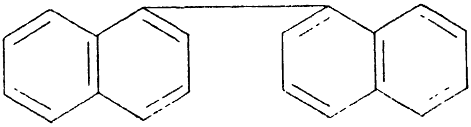
References on Indene with Two Phenyl Substitutions

1. Banús, A. G., Anales soc. españ. fís. quím. **26,** 372 **1928;** Chem. Zentr. **1929,** II, 1412.
2. Banús, A. G., and F. Calvet, Anales soc. españ. fís. quím. **27,** 49 **1929;** C.A. **23,** 3205 **1929.**
3. Bergmann, E., and A. Bondi, Ber. **63,** 1158 **1930.**
4. Bergmann, E., and H. Weisz, Ann. **480,** 64 **1930.**
5. Bettzieche, F., and A. Ehrlich, Z. physiol. Chem. **160,** 1 **1926.**
6. Blum-Bergmann, O., Ann. **484,** 26 **1930.**
7. Blum-Bergmann, O., Ber. **65,** 109 **1932.**
8. Blum-Bergmann, O., J. Chem. Soc. **1935,** 1020.
9. Blum-Bergmann, O., J. Chem. Soc. **1938,** 723.
10. Courtot, C., Ann. chim. [9] **5,** 52 **1916.**
11. Courtot, C., Compt. rend. **160,** 523 **1915.**
12. Dufraisse, C., and L. Enderlin, Bull. soc. chim. [5] **1,** 267 **1934.**
13. Gagnon, P., Ann. chim. [10] **12,** 296 **1929.**
14. Gagnon, P. E., L. Gravel, and L. P. Amiot, Can. J. Research **22B,** 32 **1944.**
15. Ingold, C. K., and C. L. Wilson, J. Chem. Soc. **1933,** 1493.
16. Koelsch, C. F., J. Am. Chem. Soc. **56,** 1605 **1934.**
17. Koelsch, C. F., and P. R. Johnson, J. Am. Chem. Soc. **65,** 567 **1943.**
18. McKenzie, A., and J. R. Myles, Ber. **65,** 209 **1932.**
19. Orekhov, A., Ber. **47,** 89 **1914.**
20. Orekhov, A., Bull. soc. chim. [4] **25,** 598 **1919.**
21. Orekhov, A. P., and R. Grinberg, J. Russ. Phys. Chem. Soc. **48,** 1702 **1916;** C.A. **11,** 3275 **1917;** Chem. Zentr. **1923,** I, 1619.
22. Orekhov, A. P., and R. Grinberg, J. Russ. Phys. Chem. Soc. **48,** 1713 **1916;** C.A. **11,** 3275 **1917;** Chem. Zentr. **1923,** I, 1619.
23. Orekhov, A., and M. Tiffeneau, Bull. soc. chim. [4] **31,** 253 **1922.**
24. Roger, R., and A. McKenzie, Ber. **62,** 272 **1929.**
25. Ruggli, P., Ann. **414,** 125 **1917.**
26. Schlenk, W., and E. Bergmann, Ann. **463,** 1 **1928.**
27. Thiele, J., and S. Bühner, Ann. **347,** 249 **1906.**
28. Thiele, J., and K. Merck, Ann. **415,** 257 **1918.**
29. Thiele, J., and P. Ruggli, Ann. **393,** 61 **1912.**
30. Wuest, H.-M., Ann. **415,** 291 **1918.**
31. Ziegler, K., H. Grabbe, and F. Ulrich, Ber. **57.** 1983 **1924.**

2. BINAPHTHYLS, THEIR ALKYL DERIVATIVES, AND TWO NAPHTHYL SUBSTITUTIONS ON ALKANES, C_nH_{2n-26}

$C_{20}H_{14}$

1,1′-Binaphthyl



M. P., °C

155.5

160.5[22, 46]

157–158[18]

156[25, 37]

155[5, 27, 38]

154–155[36]

154 (a)

153–154[24]

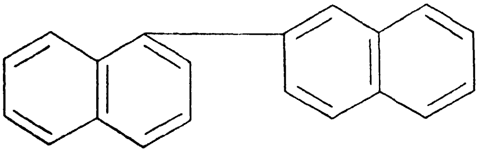
153[9]

B. P., °C @ 760mm

240–244 12[37]

(a) The melting point 154 is found in references 2, 6, 16, 17, 20, 21, 26, 30, 32, 35, 41.

1,2′-Binaphthyl



M. P., °C

76

79–80[22, 42]

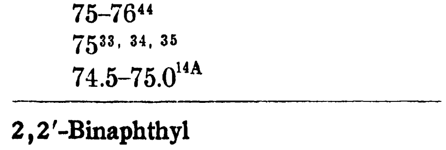
76[36]

75–76[44]

75[33, 34, 35]

74.5–75.0[14A]

2,2′-Binaphthyl



M. P., °C

187

190[3, 28]

187–189[12]

188[43]

187–188[4]

187.8[7]

187.5[22]

187 (a)

186[23, 47]

184[25]

182–184[31]

181–182.5[29]

182[14, 15]

B. P., °C @ 760mm

452[7]

(a) The melting point 187 is found in references 1, 8, 10, 11, 13, 17, 19, 33, 34, 35, 36, 39, 40, 45.

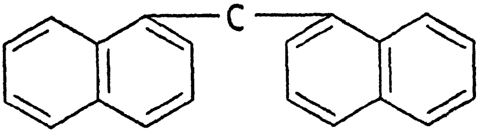
References on Binaphthyls

1. Bamberger, E., and F. D. Chattaway, Ann. **284, 52 1895.**
2. Bennett, G. M., and E. E. Turner, J. Chem. Soc. **105,** 1057 **1914.**
3. Bodroux, F., Bull. soc. chim. [3] **25,** 491 **1901.**
4. Bradley, M. J., and S. W. Parr, Chem. & Met. Eng. **27,** 737 **1922.**
5. Brass, K., and R. Patzelt, Ber. **70,** 1349 **1937.**
6. Busch, M., and W. Weber, J. prakt. Chem. [2] **146,** 1 **1936.**
7. Chattaway, F. D., J. Chem. Soc. **67,** 653 **1895.**
8. Chattaway, F. D., and W. H. Lewis, J. Chem. Soc. **65,** 869 **1894.**
9. Corbellini, A., and F. Steffenoni, Rend. ist. lombardo sci. [2] **69,** 429 **1936;** Chem. Zentr. **1937,** I, 1420.
10. Cumming, W. M., and G. Howie, J. Chem. Soc. **1932,** 528.
11. Cumming, W. M., and G. D. Muir, J. Roy. Tech. Coll. Glasgow **4, 61 1937.**

12. Dziewoński, K., and J. Moszew, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1928A**, 283.
13. Ferko, P., Ber. **20**, 660 **1887**.
14. Fröschl, N., and J. Harlass, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **140**, Abt. IIb, 703 **1931**.
14A. Hooker, S. C., and L. F. Fieser, J. Am. Chem. Soc. **58**, 1216 **1936**.
15. Inove, H., and K. Ishimura, Bull. Chem. Soc. Japan **9**, 431 **1934**.
16. Julius, P., Ber. **19**, 2549 **1886**.
17. Korn, O., Ber. **17**, 3019 **1884**.
18. Kursanov, D. N., A. S. Kursanova, and A. N. Blokhina, J. Gen. Chem. (U.S.S.R.) **8**, 1786 **1938**; C. A. **33**, 4979 **1939**.
19. Loevenich, J., and A. Loeser, Ber. **60**, 320 **1927**.
20. Loevenich, J., and K. Sipmann, J. prakt. Chem. [2] **124**, 127 **1929**.
21. Lossen, F., Ann. **144**, 71 **1867**.
22. Mascarelli, L., Gazz. chim. ital. **58**, 791 **1928**.
23. Meyer, H., and A. Hoffmann, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **125–126**, Abt. IIb, 449 **1916–17**.
24. Müller, E., and T. Töpel, Ber. **72**, 273 **1939**.
25. Ogawa, T., Bull. Chem. Soc. Japan **6**, 174 **1931**.
26. Onufrowicz, S., Ber. **23**, 3355 **1890**.
27. Pestemer, M., and J. Cecelsky, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **140**, Abt. IIb, 541 **1931**.
28. Roux, L., Ann. chim. phys. [6] **12**, 289 **1887**.
29. Sachanen (Sakhanin), A. N., and M. D. Tilicheev, Ber. **62**, 658 **1929**.
30. Sakellarios, E., and T. Kyrimis, Ber. **57**, 322 **1924**.
31. Schroeter, G., Ber. **57**, 1990 **1924**.
32. Smith, W., Ber. **4**, 888 **1871**.
33. Smith, W., Ber. **10**, 1272 **1877**.
34. Smith, W., Ber. **10**, 1603 **1877**.
35. Smith, W., J. Chem. Soc. **32**, 551 **1877**.
36. Smith, W., J. Chem. Soc. **35**, 224 **1879**.
37. Späth, E., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **122**, Abt. IIb, 1207 **1913**.
38. Ullmann, F., and J. Bielecki, Ber. **34**, 2174 **1901**.
39. Veselý, V., and F. Štursa, Chem. Listy **26**, 495 **1932**; C. A. **27**, 717 **1933**; Chem. Zentr. **1933**, I, 3079.
40. Veselý, V., and F. Štursa, Collection Czechoslov. Chem. Commun. **4**, 139 **1932**.
41. Walder, H., Ber. **15**, 2166 **1882**.
42. Wegscheider, R., Ber. **23**, 3199 **1890**.
43. Wegscheider, R., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **89**, Abt. II, 885 **1884**.
44. Weidlich, H. A., Ber. **71**, 1201 **1938**.
45. Weitzenböck, R., and C. Seer, Ber. **46**, 1994 **1913**.
46. Willgerodt, C., and P. Schlösser, Ber. **33**, 692 **1900**.
47. Witt, O. N., and J. Dedichen, Ber. **30**, 2655 **1897**.

$C_{21}H_{16}$

Di-1,1′-naphthylmethane



M. P., °C

108

109[1, 5, 6, 7, 15]

108–109[19]

106–107[20]

B. P., °C @ 760mm

245–250	4[1]

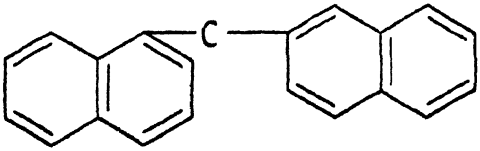
D_4^{20}

1.0224	52° [19]

n_D^{20}

1.686	52° [19]
1.677	$n_{H\alpha}^{52}$ [19]
1.712	$n_{H\beta}^{52}$ [19]

Di-1,2′-naphthylmethane

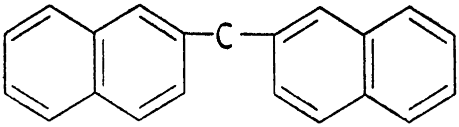


M. P., °C

96[23]

95–96[5]

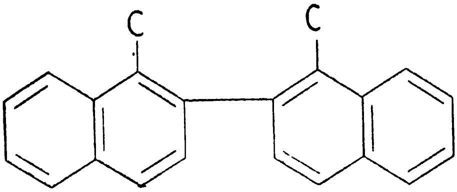
Di-2,2′-naphthylmethane



M. P., °C
$93^{5,8}$
92^{24}

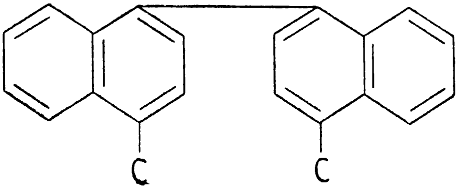
$C_{22}H_{18}$

1,1′-Dimethyl-2,2′-binaphthyl



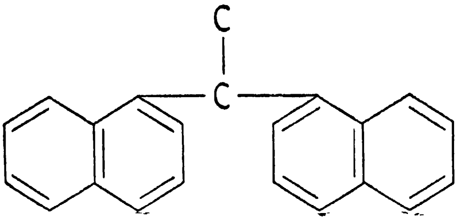
M. P., °C
230^{29}
$227^{10,21}$

4,4′-Dimethyl-1,1′-binaphthyl



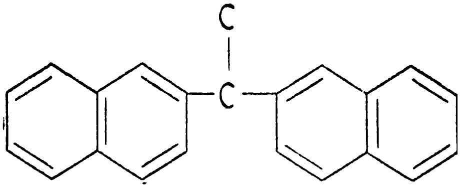
M. P., °C
147^{10}

1,1-Di-(1′-naphthyl)-ethane



M. P., °C
136^{9}

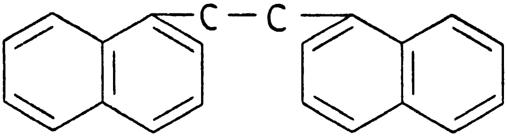
1,1-Di-(2′-naphthyl)-ethane



M. P., °C
182^{12}

This series continued on next poge

1,2-Di-(1′-naphthyl)-ethane



M. P., °C

161

162–163[30]

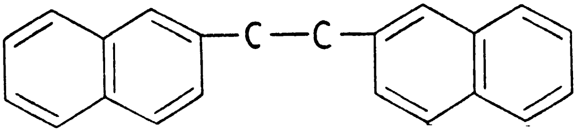
161–162[22]

161–161.5[31]

160[3, 27, 33]

159–160[11]

1,2-Di-(2′-naphthyl)-ethane



M. P., °C

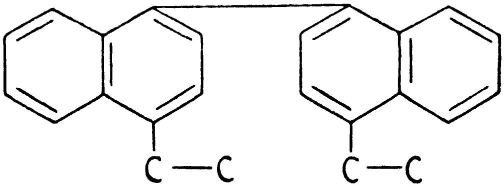
182–183[30]

182[22]

181–182[32]

$C_{24}H_{22}$

4,4′-Diethyl-1,1′-binaphthyl (a)

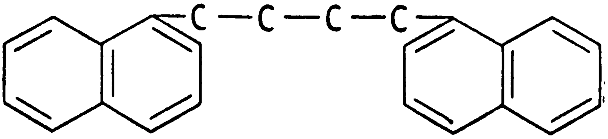


M. P., °C

76–77[18]

(a) The structure of this compound was not clearly defined in the literature.

1,4-Di-(1′-naphthyl)-butane



M. P., °C.
102[16]
101[2]

B. P., °C @ 760mm
240 3[16]

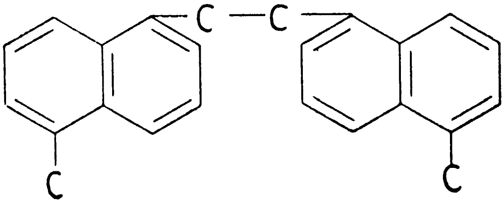
---

x,x-Di-[1′-(2′-methylnaphthyl)]-ethane (a)

M. P., °C
177–178[17]

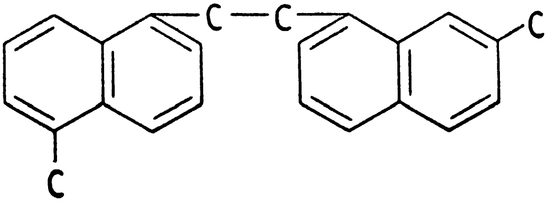
(a) The structure of this compound was not clearly defined in the literature.

1,2-Di-[1′-(5′-methylnaphthyl)]-ethane



M. P., °C
115–117[26]

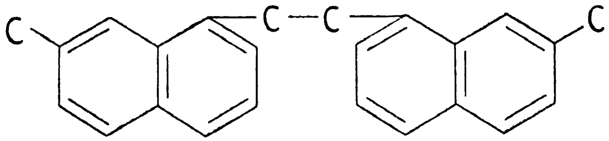
1-[1′-(5′-Methylnaphthyl)]-2-[1″-7″-methylnaphthyl)]-ethane



M. P., °C
74–75[25]

B. P., °C @ 760mm
192–193 0.1[25]

1,2-Di-[1′-(7′-methylnaphthyl)]-ethane

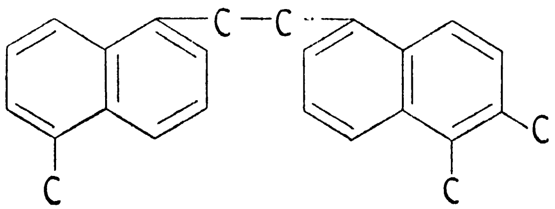


M. P., °C
122.5–123.5[28]

B. P., °C @ 760mm
220–225 0.3[28]

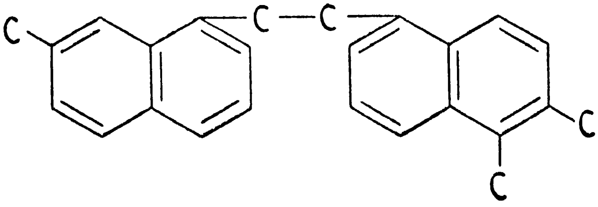
$C_{25}H_{24}$

1-[1′-(5′-Methylnaphthyl)]-2-[1″-(5″,6″-dimethylnaphthyl)]-ethane



M. P., °C
128–129[26]

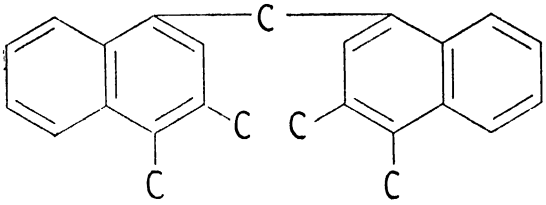
1-[1′-(7′-Methylnaphthyl)]-2-[1″-(5″,6″-dimethylnaphthyl)]-ethane



M. P., °C
108.5–109.5[28]

B. P., °C @ 760mm
225–230 0.2[28]

Di-1-(3,4-dimethylnaphthyl)-methane



M. P , °C
174–175[17]

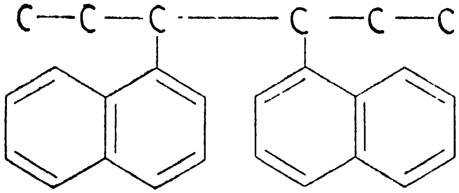
$C_{26}H_{26}$

x_6-Hexamethyl-x,x′-binaphthyl (a)

M. P., °C
183[18]

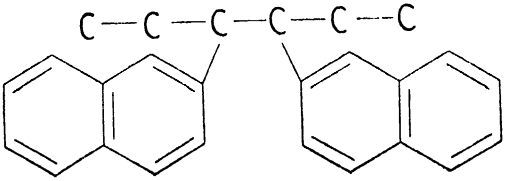
(a) The structure of this compound was not clearly defined in the literature.

3,4-Di-(1′-naphthyl)-hexane



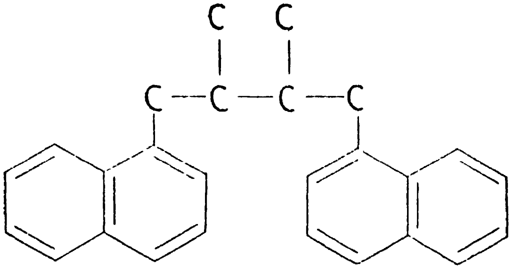
M. P., °C
155[4]

3,4-Di-(2′-naphthyl)-hexane



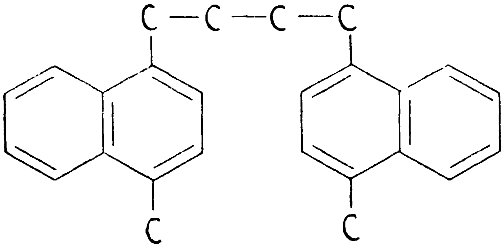
M. P., °C
198[4]

1,4-Di-(1′-naphthyl)-2,3-dimethylbutane



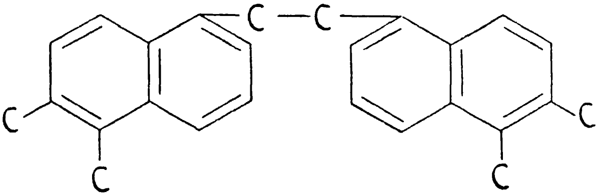
M. P., °C
131–132[2]

1,4-Di-[1′-(4′-methylnaphthyl)]-butane



M. P., °C
126–127[14]

1,2-Di-[1′-(5′,6′-dimethylnaphthyl)]-ethane



M. P., °C
163–165[26]

References on Alkyl Binaphthyls and Two Naphthyl Substitutions on Alkanes

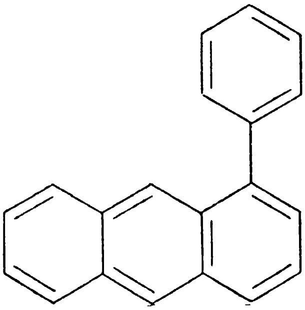
1. Anderson, A. R., and W. F. Short, J. Chem. Soc. **1933,** 485.
2. Bachmann, W. E., J. W. Cook, C. L. Hewett, and J. Iball, J. Chem. Soc. **1936,** 54.
3. Bamberger, E., and W. Lodter, Ber. **21,** 51 **1888.**
4. Campbell, N. R., and F. W. Chattaway, Proc. Roy. Soc. (London) **130B,** 435 **1942.**
5. Chichibabin, A. E., Ber. **44,** 443 **1911.**
6. Chichibabin, A. E., and O. I. Magidson, J. prakt. Chem. [2] **90, 168 1914.**

7. Chichibabin, A., and O. Magidson, J. Russ. Phys. Chem. Soc. **46,** 1389 **1914;** Chem. Zentr. **1915,** I, 1123.
8. Claus, A., and W. Ruppel, J. prakt. Chem. [2] **41,** 48 **1890.**
9. Elbs, K., J. prakt. Chem. [2] **47,** 44 **1893.**
10. Fichter, F., and S. Herszbein, Helv. Chim. Acta **11,** 1264 **1928.**
11. Friedmann, W., Ber. **49,** 277 **1916.**
12. Friedmann, W., Ber. **49,** 1352 **1916.**
13. Froschl, N., and J. Harlass, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **140,** Abt. IIb, 703 **1931.**
14. Gamble, D. J. C., and G. A. R. Kon, J. Chem. Soc. **1935,** 443.
15. Grabowski, J., Ber. **7,** 1605 **1874.**
16. Harper, S. H., G. A. R. Kon, and F. C. J. Ruzicka, J. Chem. Soc. **1934,** 124.
17. Hewett, C. L., J. Chem. Soc. **1940,** 293.
18. Kruber, O., Ber. **72,** 1972 **1939.**
19. Larsen, R. G., R. E. Thorpe, and F. A. Armfield, Ind. Eng. Chem. **34,** 183 **1942.**
20. Magidson, O. I., Ber. **58,** 433 **1925.**
21. Mayer, F., and O. Schnecko, Ber. **56,** 1408 **1923.**
22. Mayer, F., and A. Sieglitz, Ber. **55,** 1835 **1922.**
23. Migita, M., Bull. Chem. Soc. Japan **8,** 22 **1933.**
24. Richter, M., Ber. **13,** 1728 **1880.**
25. Ruzicka, L., and K. Hofmann, Helv. Chim. Acta **20,** 1155 **1937.**
26. Ruzicka, L., and K. Hofmann, Helv. Chim. Acta **22,** 126 **1939.**
27. Ruzicka, L., and H. Hosli, Helv. Chim. Acta **17,** 470 **1934.**
28. Ruzicka, L., and E. Morgeli, Helv. Chim. Acta **19,** 377 **1936.**
29. Scholl, R., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **127,** Abt. IIb, 33 **1918.**
30. Shorygin, Ber. **59,** 2510 **1926.**
31. Simpson, J. C. E., J. Chem. Soc. **1943,** 447.
32. Szperl, L., Roczniki Chem. **1923,** II, 291; C. A. **18,** 1290 **1924.**
33. Weitzenbock, R., and H. Lieb, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **121,** Abt. IIb, 225 **1912.**

3. ANTHRACENE AND PHENANTHRENE WITH ONE PHENYL SUBSTITUTION, C_nH_{2n-26}

$C_{20}H_{14}$

1-Phenylanthracene

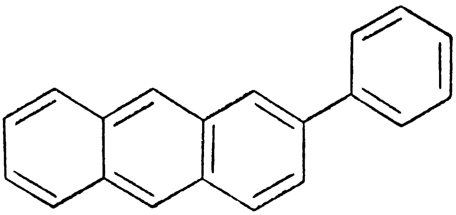


M. P., °C

123[44]

110–112[20, 22]

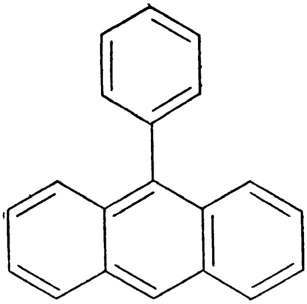
2-Phenylanthracene



M. P., °C

207-207.5[22]

9-Phenylanthracene



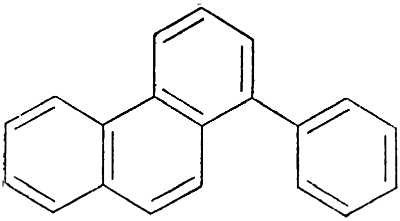
M. P., °C
154.5
155–157^{4}
156$^{27, 36, 41}$
155^{26}
152–153$^{40, 42}$
152.8^{35}

x-Phenylanthracene (a)

B. P., °C @ 760mm
417^{29}

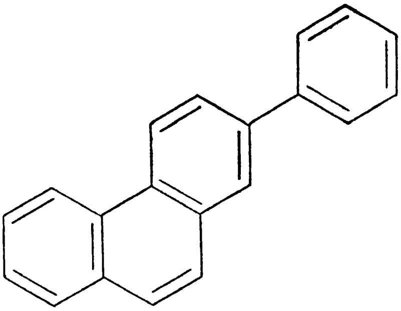
(a) The structure of this compound was not clearly defined in the literature.

1-Phenylphenanthrene



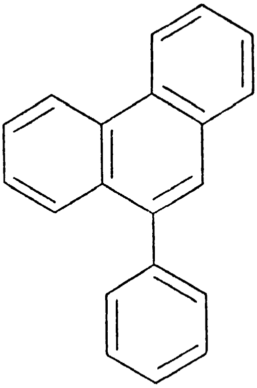
M. P., °C
79–79.5^{3}

2-Phenylphenanthrene



M. P., °C
196.6–197.2^{37}

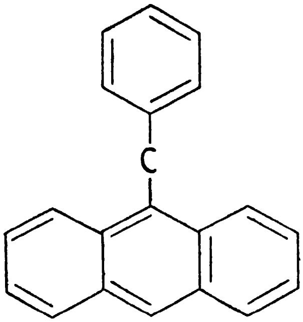
9-Phenylphenanthrene



M. P., °C
113^{43}
110^{13}
105-106$^{28, 32}$
104–105^{18}

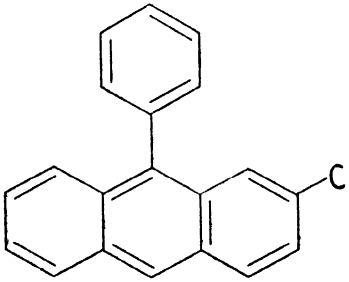
$C_{21}H_{16}$

9-Benzylanthracene



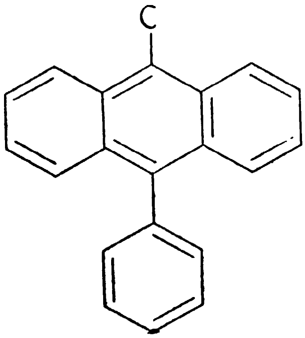
M. P., °C
$133^{14, 21}$

2-Methyl-9-phenylanthracene



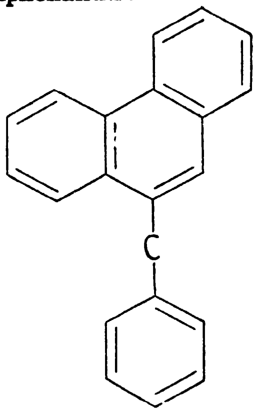
M. P., °C
$119^{31, 39}$

9-Methyl-10-phenylanthracene



M. P., °C
116^{38}
$113.5\text{–}114.5^{15}$
$112.5\text{–}113.5^{19}$
113^{12}
112^{11}

9-Benzylphenanthrene



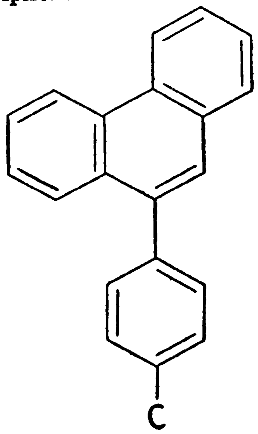
M. P., °C
$155\text{–}156^{30}$
154^{24}
$153\text{–}154^{1, 2}$

x-Benzylphenanthrene (a)

M. P., °C
$107\text{–}108^{2}$
$105\text{–}106^{2}$
$95\text{–}96^{2}$
$91\text{–}92^{45}$
$79\text{–}80^{2}$

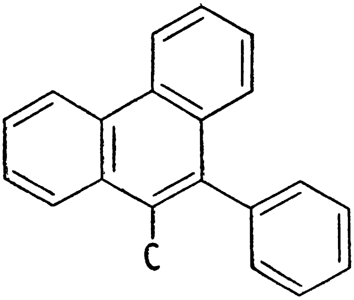
(a) The structures of these compounds were not clearly defined in the literature.

9-*p*-Tolylphenanthrene



M. P., °C
$90\text{–}91^{18}$

9-Methyl-10-phenylphenanthrene

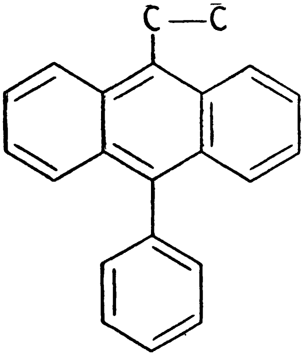


M. P., °C
99–100[17]

M. P., °C
139[6]

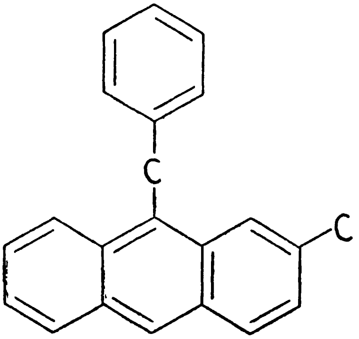
$C_{22}H_{18}$

9-Ethyl-10-phenylanthracene

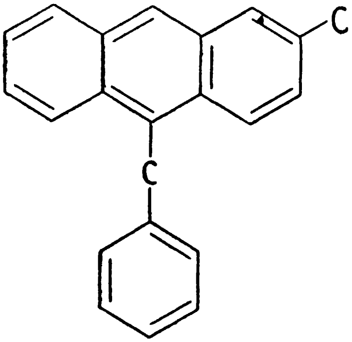


M. P., °C
110[5]
107–108.5[19]

2-Methyl-9-benzylanthracene

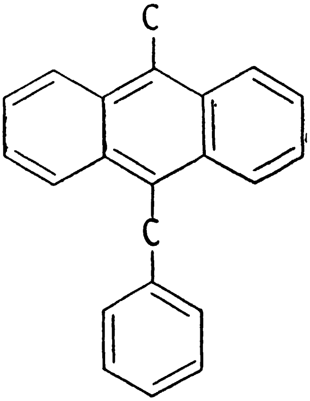


2-Methyl-10-benzylanthracene



M. P., °C
101[6]

9-Methyl-10-benzylanthracene

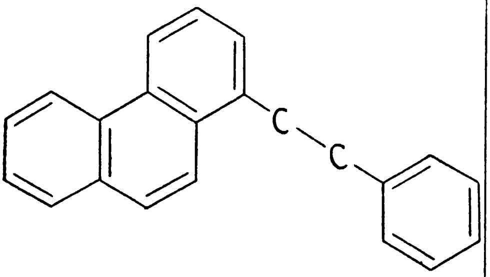


M. P., °C
167.8–168.6[15]

x-Methyl-9-tolylanthracene (a)
M. P., °C
191[34]

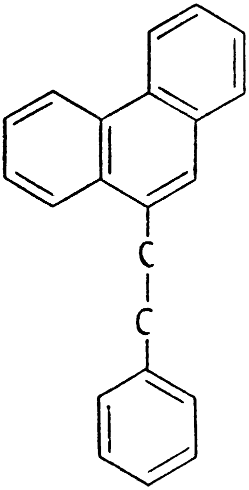
(a) The structure of this compound was not clearly defined in the literature.

1-Phenethylphenanthrene



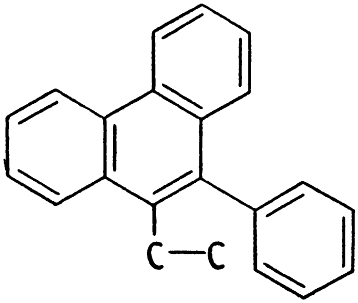
M. P., °C
86.5–89.5[25]

9-Phenethylphenanthrene



M. P., °C
81.5[13]

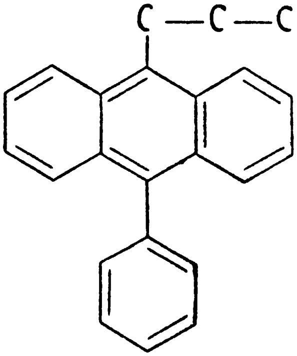
9-Ethyl-10-phenylphenanthrene



M. P., °C
161[17]

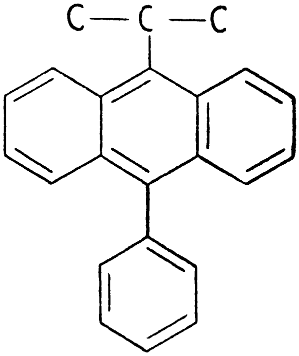
$C_{23}H_{20}$

9-*n*-Propyl-10-phenylanthracene



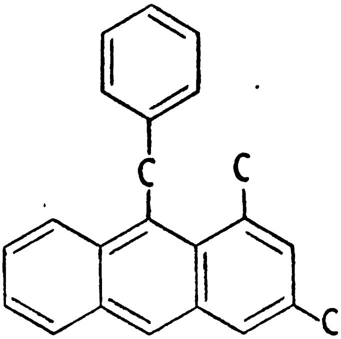
M. P., °C
115–116[5]

9-Isopropyl-10-phenylanthracene



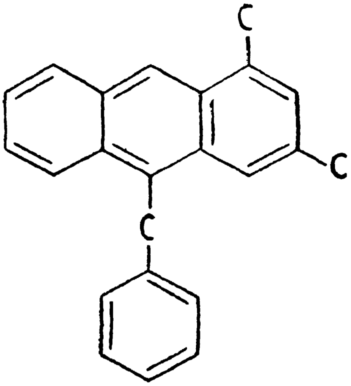
M. P., °C
166–167[5]

1,3-Dimethyl-9-benzylanthracene



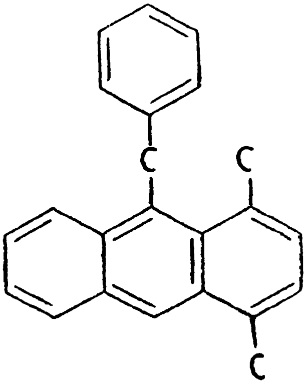
M. P., °C
126[8]

1,3-Dimethyl-10-benzylanthracene



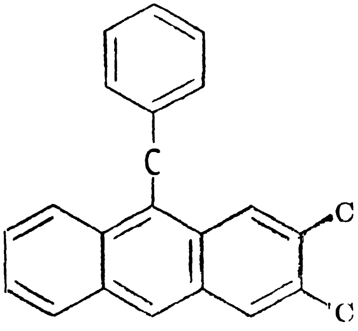
M. P., °C
149[8]

1,4-Dimethyl-9-benzylanthracene



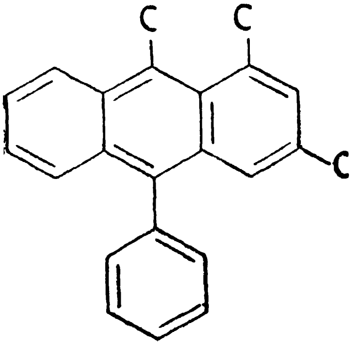
M. P., °C
135[9]

2,3-Dimethyl-9-benzylanthracene



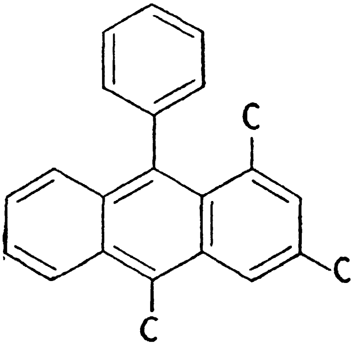
M. P., °C
149[10]

1,3,9-Trimethyl-10-phenylanthracene



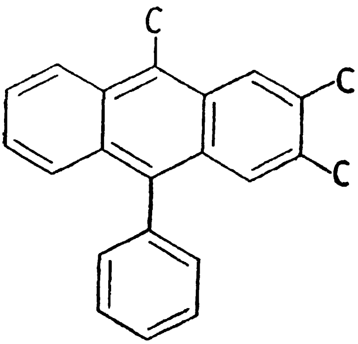
M. P., °C
165[8]

1,3,10-Trimethyl-9-phenylanthracene



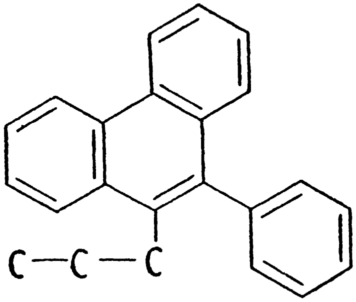
M. P., °C
121[8]

2,3,9-Trimethyl-10-phenylanthracene



M. P., °C
119[10]

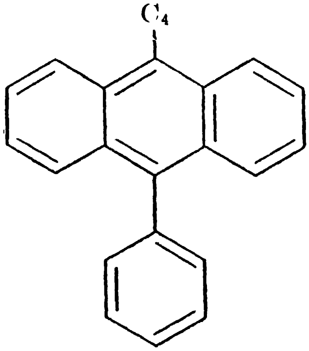
9-*n*-Propyl-10-phenylphenanthrene



M. P., °C
148.5–149.5[16]

$C_{24}H_{22}$

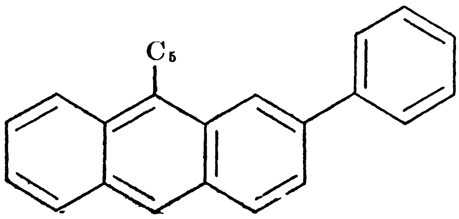
9-Butyl-10-phenylanthracene



M. P., °C
156[5]

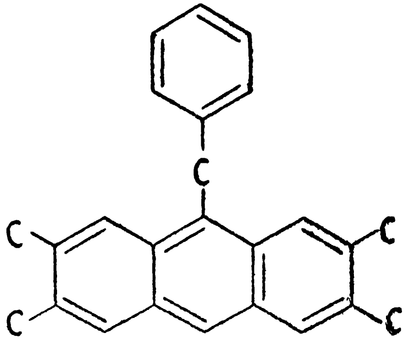
$C_{25}H_{24}$

2-Phenyl-9-pentylanthracene



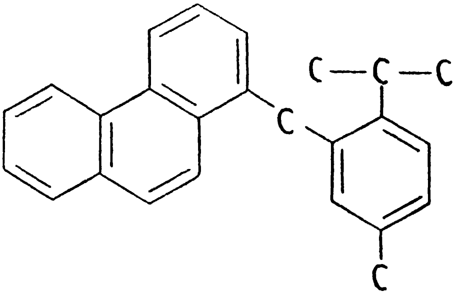
M. P., °C
203–204[5]

2,3,6,7-Tetramethyl-9-benzylanthracene



M. P., °C
235[7]

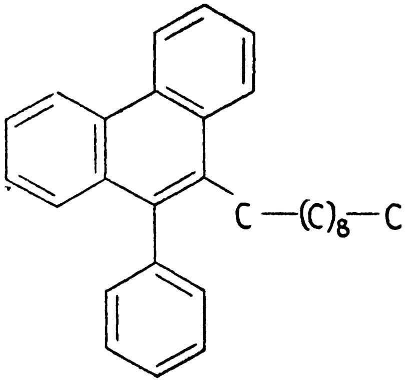
1-(2′-Isopropyl-5′-methylbenzyl)-phenanthrene



M. P., °C
115–116[23]

$C_{30}H_{34}$

9-Phenyl-10-*n*-decylphenanthrene



M. P., °C
99–100[16]

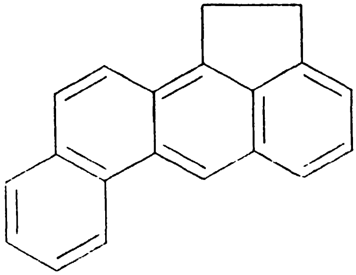
References on Anthracene and Phenanthrene with One Phenyl Substitution

1. Bachmann, W. E., J. Am. Chem. Soc. **56,** 1363 **1934.**
2. Bachmann, W. E., J. Am. Chem. Soc. **57, 555 1935.**
3. Bachmann, W. E., and A. L. Wilds, J. Am. Chem. Soc. **60,** 624 **1938.**
4. Barnett, E. de B., J. W. Cook, and I. G. Nixon, J. Chem. Soc. **1927,** 504.
5. Barnett, E. de B., J. W. Cook, and J. L. Wiltshire, J. Chem. Soc. **1927,** 1724.
6. Barnett, E. de B., and N. F. Goodway, J. Chem. Soc. **1929,** 1754.
7. Barnett, E. de B., N. F. Goodway, and J. W. Watson, Ber. **66,** 1876 **1933.**
8. Barnett, E. de B., and C. L. Hewett, Ber. **64,** 1572 **1931.**
9. Barnett, E. de B., and J A. Low, Ber. **64,** 49 **1931.**
10. Barnett, E. de B., and F. C. Marrison, Ber. **64,** 535 **1931.**
11. Barnett, E. de B., and M. A. Mathews, Ber. **59,** 1429 **1926.**
12. Bergmann, E., Ber. **63,** 1037 **1930.**
13. Bergmann, E., and F. Bergmann, J. Am. Chem. Soc. **59,** 1443 **1937.**
14. Bergmann, E., and S. Fujise, Ann. **480,** 188 **1930.**
15. Berliner, E., J. Am. Chem. Soc. **66,** 533 **1944.**
16. Bradsher, C. K., and S. T. Amore, J. Am. Chem. Soc. **66,** 1280 **1944.**
17. Bradsher, C. K., and R. Rosher, J. Am. Chem. Soc. **61,** 1524 **1939.**
18. Bradsher, C. K., and A. K. Schneider, J. Am. Chem. Soc. **60,** 2960 **1938.**
19. Bradsher, C. K., and E. S. Smith, J. Am. Chem. Soc. **65,** 451 **1943.**
20. Charrier, G., and E. Ghigi, Ber. **69,** 2211 **1936.**
21. Cook, J. W., J. Chem. Soc. **1926,** 2160.
22. Cook, J. W., J. Chem. Soc. **1930,** 1087.
23. Cook, J. W., C. L. Hewett, W. V. Mayneord, and E. Roe, J. Chem. Soc. **1934,** 1727.
24. Dilthey, W., S. Henkels, and M. Leonhard, J. prakt. Chem. [2] **151,** 97 **1938.**
25. Drake, N. L., and W. C. McVey, J. Org. Chem. **4,** 464 **1939.**
26. Dufraisse, C., and D. Daniel, Bull. soc. chim. [5] **4,** 2063 **1937.**
27. Dufraisse, C., L. Velluz, and Mme. L. Velluz, Bull. soc. chim. [5] **4,** 1260 **1937.**
28. Eschinazi, H. E., and F. Bergmann, J. Am. Chem. Soc. **65,** 1411 **1943.**
29. Friedel, C., and J. M. Crafts, Ann. chim. phys. [6] **1,** 449 **1884.**
30. Goldschmiedt, G., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **84,** Abt. IIb, 305 **1881.**
31. Hemilian, W., Ber. **16,** 2360 **1883.**
32. Koelsch, C. F., J. Am. Chem. Soc. **56,** 480 **1934.**
33. Kroll̊pfeiffer, F., and F. Branscheid, Ber. **56,** 1617 **1923.**
34. Limpricht, H., Ann. **299,** 286 **1898.**
35. Linebarger, C. E., Am. Chem. J. **13,** 554 **1891.**
36. McVicker, W. H., J. K. Marsh, and A. W. Stewart, J. Chem. Soc. **127,** 999 **1925.**
37. Newman, M. S., J. Org. Chem. **9,** 518 **1944.**
38. Schlenk, W., and E. Bergmann, Ann. **463,** 1 **1928.**
39. Scholl, R., H. Delmert, and L. Wanka, Ann. **493,** 56 **1932.**
40. Scholl, R., and J. Donat, Ann. **512,** 1 **1934.**
41. Velluz, L., Compt. rend. **206,** 1514 **1938.**
42. von Baeyer, A., and A. Schillinger, Ann. **202,** 54 **1880.**
43. Weizmann, C., E. Bergmann, and T. Berlin, J.. Am. Chem. Soc. **60,** 1331 **1938.**
44. Weizmann, C., E. Bergmann, and L. Haskelberg, J. Chem. Soc. **1939,** 391.
45. Willgerodt, C., and B. Albert, J. prakt. Chem. [2] **84, 383 1911.**

4. CHOLANTHRENE AND ITS ALKYL DERIVATIVES, C_nH_{2n-26}

$C_{20}H_{14}$

Cholanthrene



M. P., °C

172

173.0–173.5[25]

173–173.5[20]

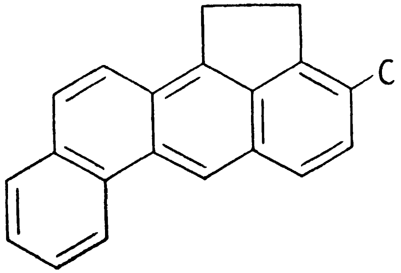
170–171[11]

170.1–170.6[12]

168.5–170[2, 10]

$C_{21}H_{16}$

3-Methylcholanthrene



M. P., °C

178.9

180.3–180.6[1]

179.5–180[15]

178.5–179.5[21]

178.5–179[16, 18, 25]

178–179[24]

177–178[16]

176.5–177.5[9]

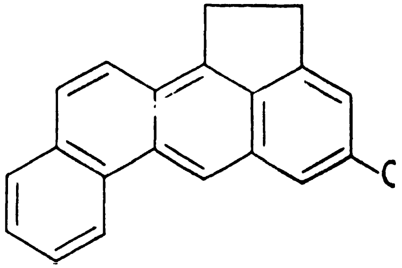
175.3–177.1[12]

176–177[17]

175–177[4]

175.5[14]

4-Methylcholanthrene

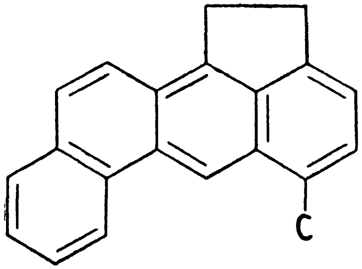


M. P., °C

154.5–155[3]

153–154[13]

5-Methylcholanthrene

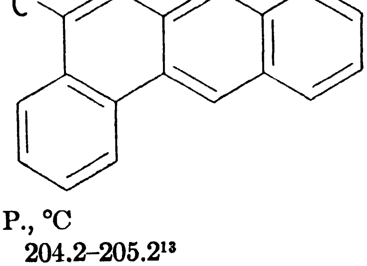


M. P., °C

160–161.5 (a)[3]

(a) This compound remelts at 164–165.

11-Methylcholanthrene



M. P., °C

204.2–205.2[13]

x-Methylcholanthrene (a)

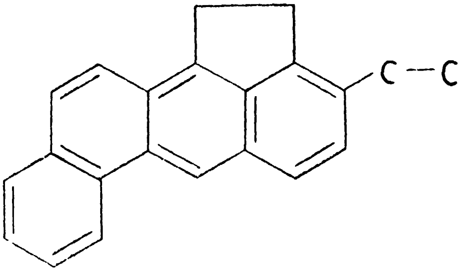
D_4^{20}

1.277[23]

(a) The structure of this compound was not clearly defined in the literature.

$C_{22}H_{18}$

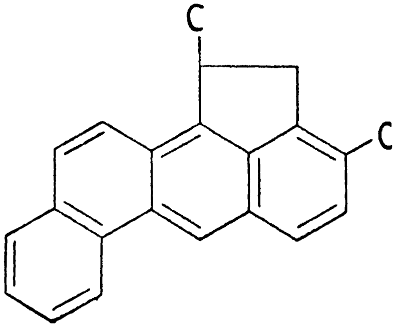
3-Ethylcholanthrene



M. P., °C

179.5–180[5, 7]

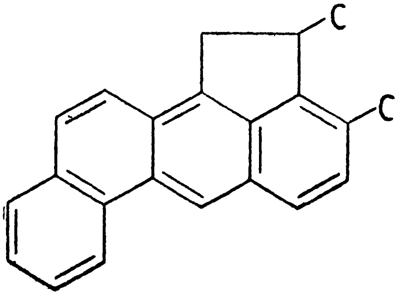
1,3-Dimethylcholanthrene



M. P., °C

179–180[6]

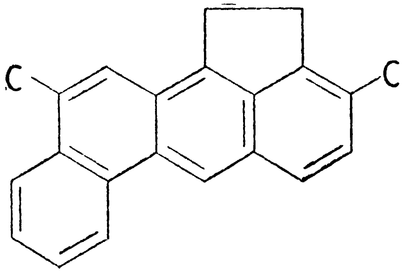
2,3-Dimethylcholanthrene



M. P., °C

169–170[19, 26]

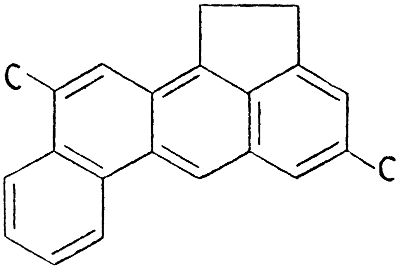
3,11-Dimethylcholanthrene



M. P., °C

175.8–176.5[13]

4,11-Dimethylcholanthrene

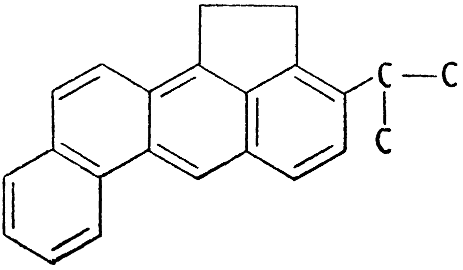


M. P., °C

161.7–162.4[13]

$C_{23}H_{20}$

3-Isopropylcholanthrene

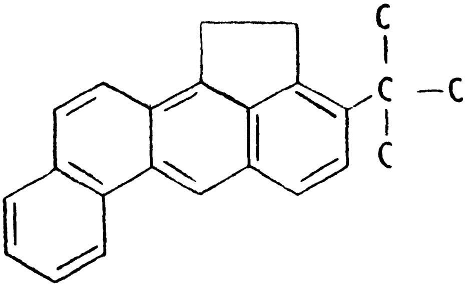


M. P., °C

188–189[8]

$C_{24}H_{22}$

3-*tert*-Butylcholanthrene



M. P., °C
204–205[22]

References on Cholanthrene and Its Alkyl Derivatives

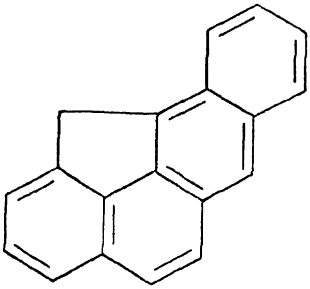
1. Bachmann, W. E., J. Org. Chem. **1,** 347 **1936–37.**
2. Bachmann, W. E , J. Org. Chem. **3,** 434 **1938–39.**
3. Bachmann, W. E., and J. M. Chemerda, J. Org. Chem. **6,** 50 **1941.**
4. Bergmann, E , and O. Blum-Bergmann, J. Am. Chem. Soc. **59,** 1573 **1937.**
5. Bruce, W. F., through L. F. Fieser and D. K. Snow, J. Am. Chem. Soc. **60,** 176 **1938.**
6. Bruce, W. F., and L. F. Fieser, J. Am. Chem. Soc. **59,** 479 **1937.**
7. Bruce, W. F., and S. J. Kahn, J. Am. Chem. Soc. **60,** 1017 **1938.**
8. Bruce, W. F., and F. Todd, J. Am. Chem. Soc. **61,** 157 **1939.**
9. Cook, J. W., and G. A. D. Haslewood, J. Chem. Soc. **1934,** 428.
10. Cook, J. W., and G. A. D. Haslewood, J. Chem. Soc. **1935,** 770.
11. Cook, J. W., G. A. D. Haslewood, and A. M. Robinson, J. Chem. Soc. **1935,** 665.
12. Davis, W. W , M. E. Krahl, and G. H. A. Clowes, J. Am. Chem. Soc. **62,** 3080 **1940.**
13. Fieser, L. F., and D. M. Bowen, J. Am. Chem. Soc. **62,** 2103 **1940.**
14. Fieser, L. F., and V. Desreux, J. Am. Chem. Soc. **60,** 2255 **1938.**
15. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **60,** 940 **1938.**
16. Fieser, L. F., and M. Newman, J. Am. Chem. Soc. **57,** 961 **1935.**
17. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **57,** 228 **1935.**
18. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **57,** 942 **1935.**
19. Fieser, L. F., and A. Seligman, J. Am. Chem. Soc. **57,** 1377 **1935.**
20. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **57,** 2174 **1935.**
21. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **58,** 2182 **1936.**
22. Fieser, L. F., and D. K. Snow, J. Am. Chem. Soc. **60,** 176 **1938.**
23. Iball, J., Z. Krist. **94,** 7 **1936;** Chem. Zentr. **1936,** II, 3293.
24. Sannié, C., Bull. soc chim. [5] **5,** 260 **1938.**
25. Shear, M. J., Am. J. Cancer **26,** 322 **1936.**
26. Shear, M. J., Am. J. Cancer **28,** 334 **1936.**

*

5. OTHER BENZOCYCLANOANTHRACENES, BENZOCYCLANOPHENANTHRENES, AND THEIR ALKYL DERIVATIVES, C_nH_{2n-26}

$C_{19}H_{12}$

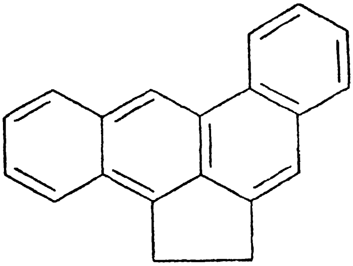
Benzo-[b]-cyclopentano-[def]-phenanthrene



M. P., °C
122.7–123.1[6]
122.5–123[7]
120–121[8]

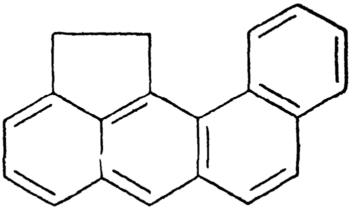
$C_{20}H_{14}$

Benzo-[a]-cyclopentano-[de]-anthracene



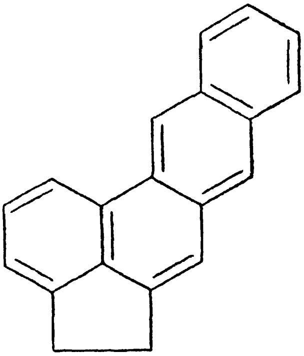
M. P., °C
138.5–140[12]
137–138[18]
133–134[17]
130[4]

Benzo-[a]-cyclopentano-[kl]-anthracene



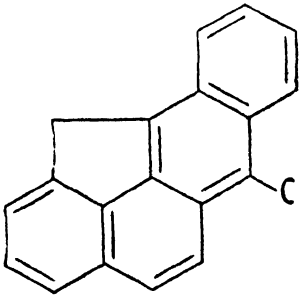
M. P., °C
176.5–177[10, 18]

Benzo-[b]-cyclopentano-[jk]-phenanthrene



M. P., °C
233.1–234.3[5]
192.5–193.5[13]
192[1]

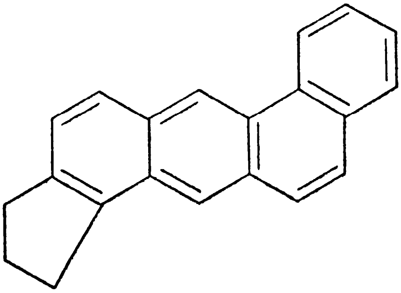
Benzo-[b]-cyclopentano-[def]-1-methylphenanthrene



M. P., °C
181–181.4[7]

$C_{21}H_{16}$

1,2-Benzo-5,6-cyclopentanoanthracene



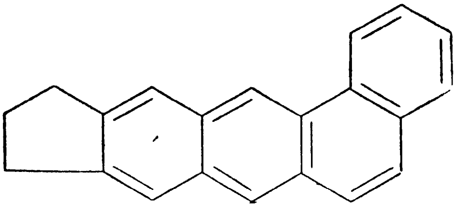
M. P., °C

199–200$^{2, 3}$

D_4^{20}

1.255 18° ^{14}

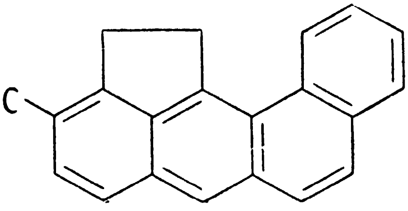
1,2-Benzo-6,7-cyclopentanoanthracene



M. P., °C

164–165^{3}

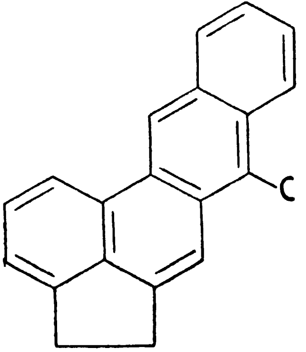
Benzo-[a]-cyclopentano-[kl]-7-methylanthracene



M. P., °C

187.5$^{9, 18}$

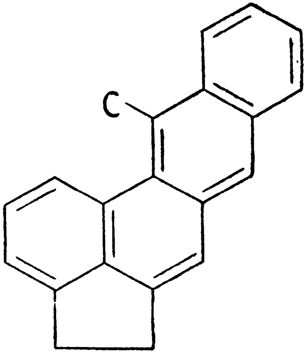
Benzo-[b]-cyclopentano-[jk]-1-methylphenanthrene



M. P., °C

181.7–182.5^{16}

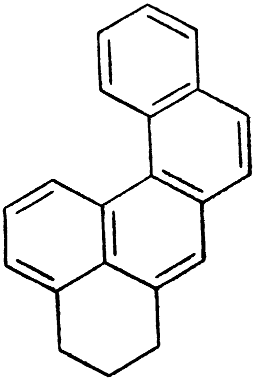
Benzo-[b]-cyclopentano-[jk]-4-methylphenanthrene



M. P., °C

133–134^{15}

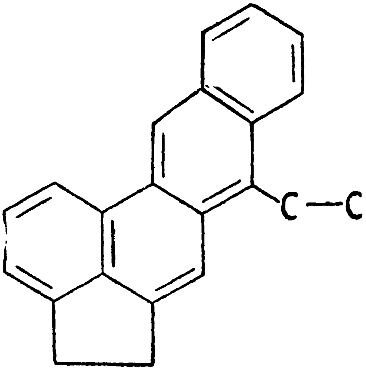
Benzo-[c]-cyclohexano-[jk]-phenanthrene



M. P., °C
138–138.5[11]

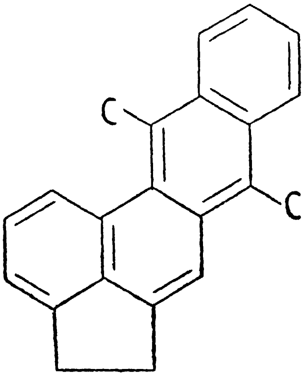
$C_{22}H_{18}$

Benzo-[b]-cyclopentano-[jk]-1-ethylphenanthrene



M. P., °C
174.5–175[16]

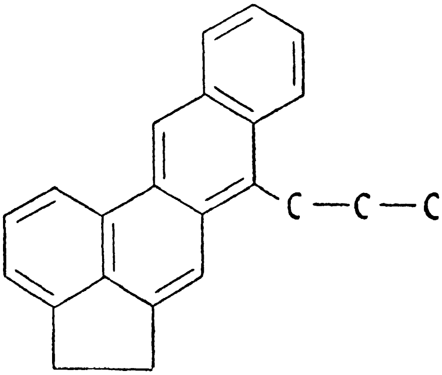
Benzo-[b]-cyclopentano-[jk]-1,4-dimethylphenanthrene



M. P., °C
164–164.5[15]

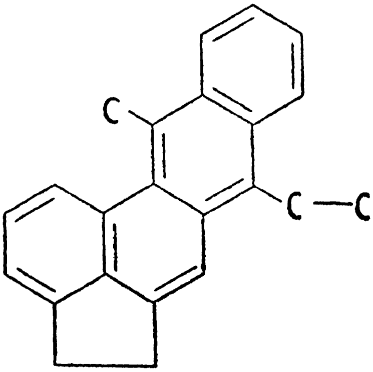
$C_{23}H_{20}$

Benzo-[b]-cyclopentano-[jk]-1-*n*-propylphenanthrene



M. P., °C
165.5–166.5[16]

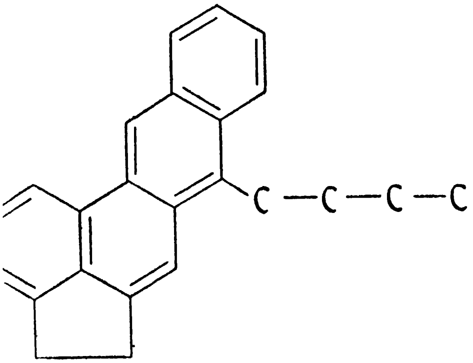
Benzo-[b]-cyclopentano-[jk]-1-ethyl-4-methylphenanthrene



M. P., °C
157.5–158.5[15]

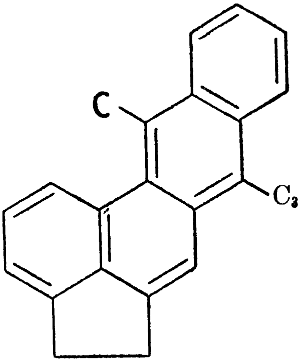
$C_{24}H_{22}$

Benzo-[b]-cyclopentano-[jk]-1-*n*-butylphenanthrene



M. P., °C
128–129[16]

Benzo-[b]-cyclopentano-[jk]-1-propyl-4-methylphenanthrene



M. P., °C
119.5–120.5[15]

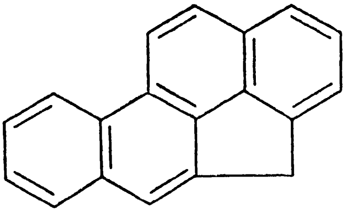
References on Other Benzocyclanoanthracenes, Benzocyclanophenanthrenes, and Their Alkyl Derivatives

1. Cook, J. W., J. Chem. Soc. **1930,** 1087.
2. Cook, J. W., J. Chem. Soc. **1931,** 499.
3. Cook, J. W., J. Chem. Soc. **1931,** 2529.
4. Dansi, A., Gazz. chim. ital. **67,** 85 **1937.**
5. Davis, W. W., M. E. Krahl, and G. H. A. Clowes, J. Am. Chem. Soc. **62,** 3080 **1940.**
6. Fieser, L. F., and J. Cason, J. Am. Chem. Soc. **61,** 1740 **1939.**
7. Fieser, L. F., and J. Cason, J. Am. Chem. Soc. **62,** 432 **1940.**
8. Fieser, L. F., and J. Cason, J. Am. Chem. Soc. **62,** 1293 **1940.**
9. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **57,** 942 **1935.**
10. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **57,** 2174 **1935.**
11. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **58,** 478 **1936.**
12. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **59,** 883 **1937.**
13. Geyer, B. P., and S. Zuffanti, J. Am. Chem. Soc. **57,** 1787 **1935.**
14. Iball, J , Z. Krist. **94,** 7 **1936;** C. A. **30,** 7412 **1936;** Chem. Zentr. **1936,** II, 3293.
15. Mikhailov, B. M., and A. N. Blokhina, J. Gen. Chem. (U.S.S.R.) **12,** 283 **1942;** C. A. **37,** 3085 **1943.**
16. Miklaĭlov, B. M., and A. N. Blokhina, J. Gen. Chem. (U.S.S.R.) **13,** 609 **1943;** Survey For. Petrol. Liter. 473B, Oct. 20, **1944.**
17. Morelli, E., and A. Dansi, Biochim. e terap. sper. **24,** 432 **1937.**
18. Shear, M. J., Am. J. Cancer **28,** 334 **1936.**

6. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-26}

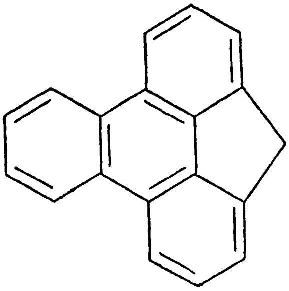
$C_{19}H_{12}$

Cyclopentano-[def]-chrysene



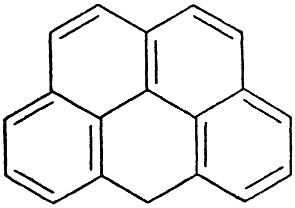
M. P., °C
172.4–172.9[22]
172–172.5[22]
171.5–172.3[22]

Cyclopentano-[def]-triphenylene



M. P., °C
115–116[37]

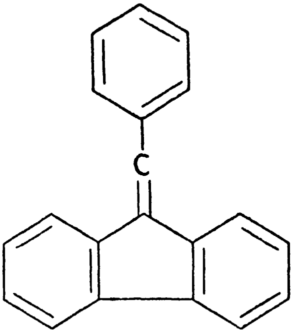
Benzo-[cd]-5-hydropyrene



M. P., °C
135[49]

$C_{20}H_{14}$

9-Benzylidenefluorene

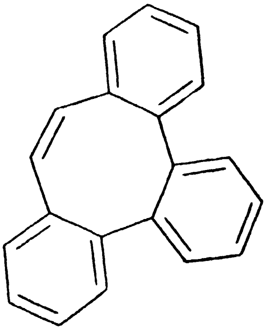


M. P., °C
153–154 (a)[42]
76 (b)

(a) This constant was determined on an isomeric form of the compound.

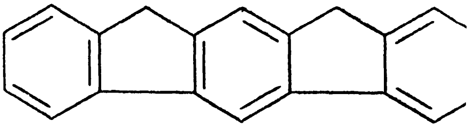
(b) The melting point 76 is found in references 32, 34, 38, 41, 46, 47, 48.

1,2,3,4,5,6-Tribenzocyclooctene-7



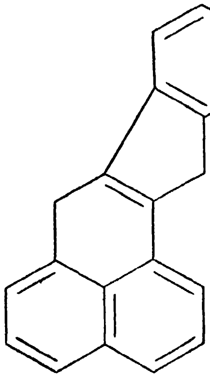
M. P., °C
138.5–139[44]

2,3-(2′,3′-Indo)-fluorene
(Ellagene)



M. P., °C
197[38]

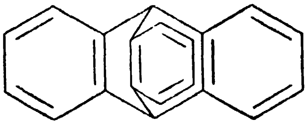
2,3-(3′,2′-Indo)-phenalene



M. P., °C
185[11]

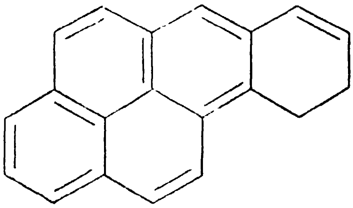
9,10-Endo-*o*-phenylene-9,10-dihydroanthracene

(Tryptycene)



M. P., °C
254.8–255.2[5]

2,3-(Cyclohexen-3′-o)-pyrene (a)

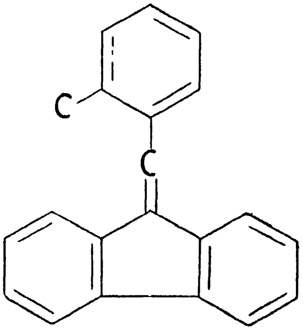


M. P., °C
149.5–150.0[1]
148–149[31]

(a) Reference 31 gives evidence that this compound may possibly be cyclohexano-[def]-chrysene.

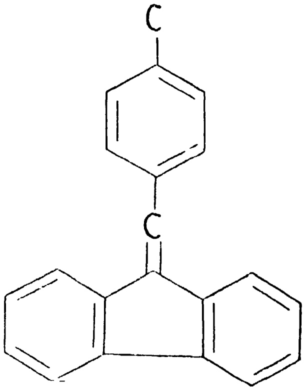
$C_{21}H_{16}$

9-(2′-Methylbenzylidene)-fluorene



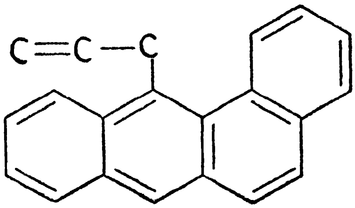
M. P., °C
109.5[15]

9-(4′-Methylbenzylidene)-fluorene



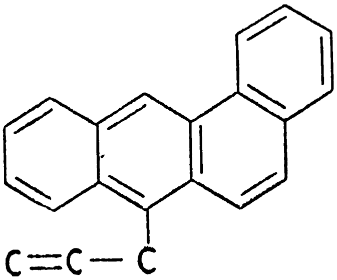
M. P., °C
97.5[15]

1,2-Benzo-9-(propen-2′-yl)-anthracene



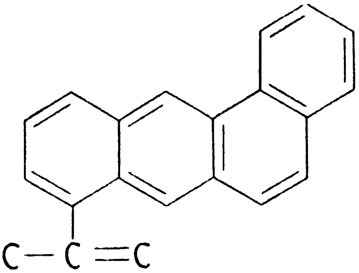
M. P., °C
115–116[26]

1,2-Benzo-10-(propen-2′-yl)-anthracene



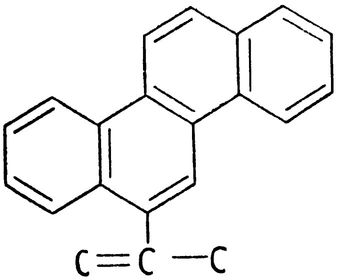
M. P., °C
125.5–126.5[25]

1,2-Benzo-5-isopropenylanthracene



M. P., °C
137–139[14]

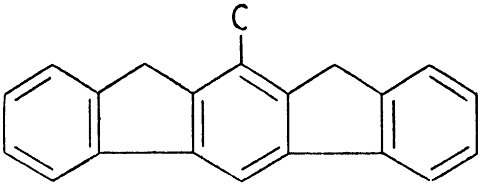
6-Isopropenylchrysene



M. P., °C
161[7]

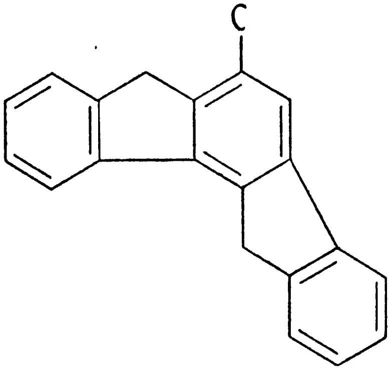
B. P., °C @ 760mm
220 - 2[7]

1-Methyl-2,3-(2′,3′-indo)-fluorene
(Isophthalacene)



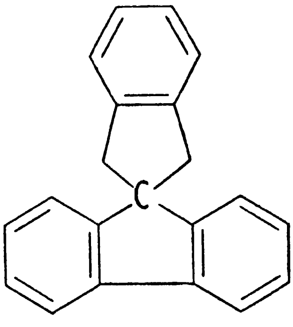
M. P., °C
222[20]

1-Methyl-3,4-(3′,2′-indo)-fluorene
(Phthalacene)



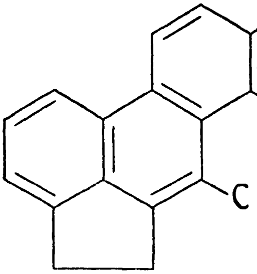
M. P., °C
173[30]

Spiro[3,4-benzocyclopentane-1,9′-fluorene]



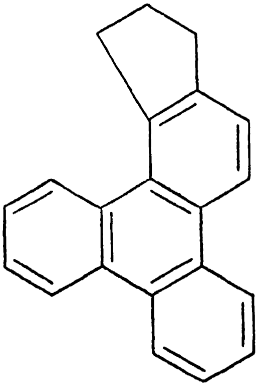
M. P., °C
220[21]

Cyclopentano-[hi]-5-methylchrysene



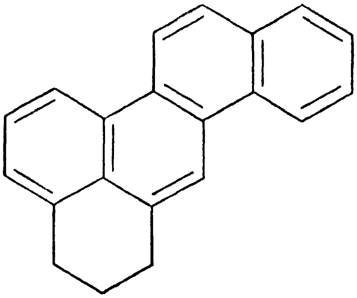
M. P., °C
169–169.5[2]

1,2-Cyclopentanotriphenylene



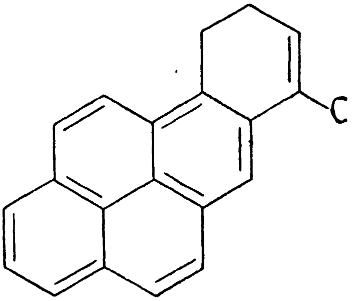
M. P., °C
171–172.5[6]
115–116[52]

Cyclohexano-[hi]-chrysene



M. P., °C
116.5–117[29, 43]

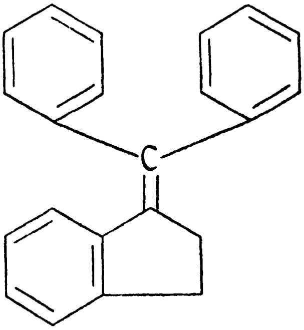
1,2-(6′-Methylcyclohexen-5′-o)-pyrene



M. P., °C
162–163[27]
155–156[23]

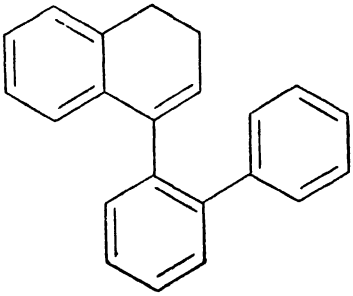
$C_{22}H_{18}$

1-Benzhydrylideneindane



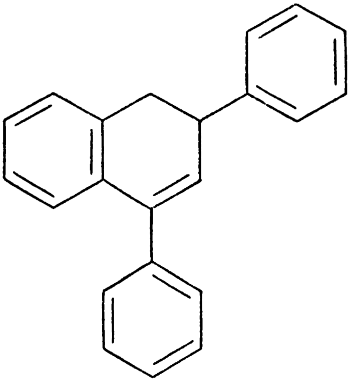
M. P., °C
92[16]

4-*o*-Biphenylyl-1,2-dihydronaphthalene



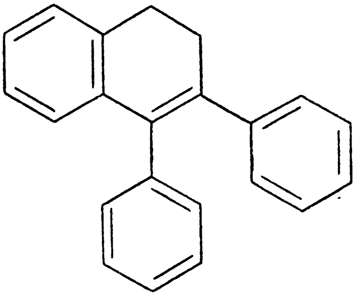
M. P., °C
75.5–76.5[9]

2,4-Diphenyl-1,2-dihydronaphthalene



M. P., °C
136[12]

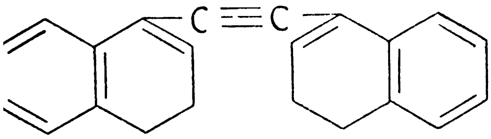
3,4-Diphenyl-1,2-dihydronaphthalene



M. P., °C
94–95[8]
76.5–77[12]
76[13]

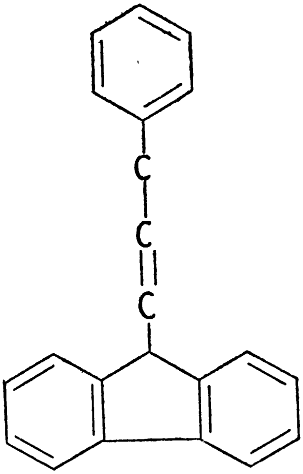
B. P., °C @ 760mm
210–215 0.5[8]

Di-1-(3,4-dihydronaphthyl)-ethyne



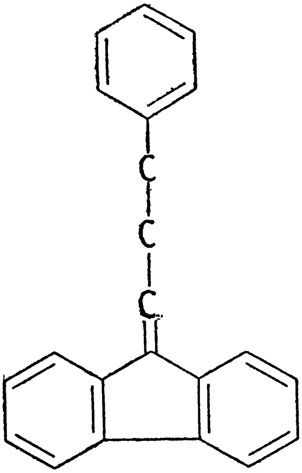
M. P., °C
124[17]
120–121[40]

1-(9′-Fluoryl)-3-phenylpropene-1



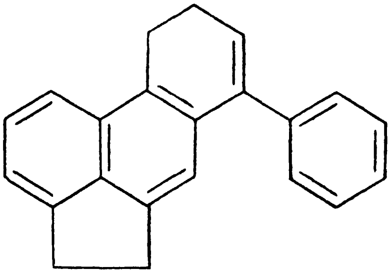
M. P., °C
88[33, 47]

1-Phenyl-3-(9′-fluorylidene)-propane



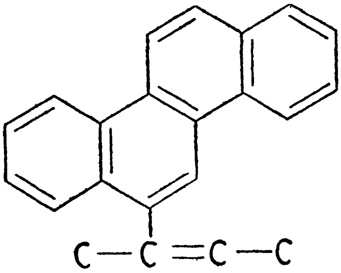
M. P., °C
81–82[47]
81[33]

Cyclopentano-[jk]-1-phenyl-3,4-dihydrophenanthrene



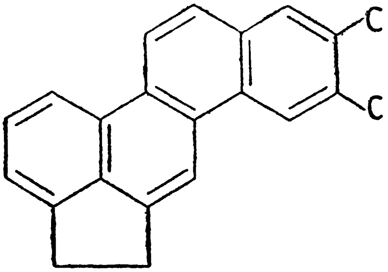
M. P., °C
144^{28}

6-(2′-Buten-2′-yl)-chrysene



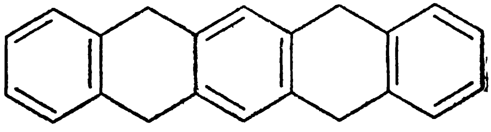
M. P., °C
$159\text{–}160^{7}$

Cyclopentano-[hi]-2,3-dimethylchrysene



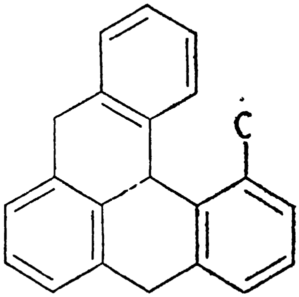
M. P., °C
$222.6\text{–}223.1^{24}$

5,7,12,14-Tetrahydropentacene



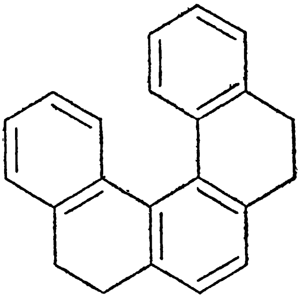
M. P., °C
$244\text{–}245^{39}$
$240\text{–}241^{36}$

2,3-Benzo-4,5-(3′-methylbenzo)-3a,6-dihydrophenalene



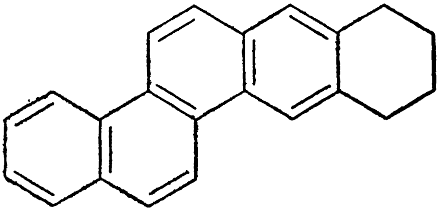
M. P., °C
182^{51}

3,4,5,6-Dibenzo-1,2,7,8-tetrahydrophenanthrene



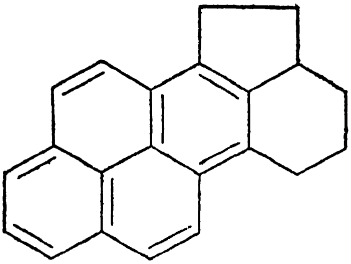
M. P., °C
142^{50}

2,3-Cyclohexanochrysene



M. P., °C
$217\text{–}218^{15}$

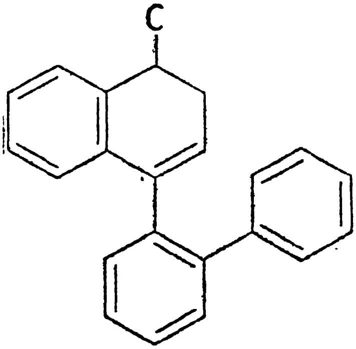
Benzo-[hij]-2a,3,4,5-tetrahydrocholanthrene



M. P., °C
227.5–228.5[35]

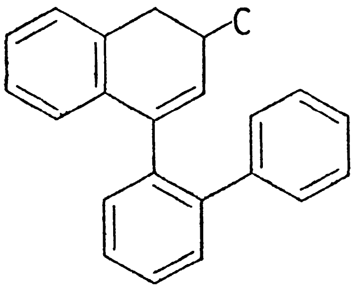
$C_{23}H_{20}$

1-Methyl-4-o-biphenylyl-1,2-dihydronaphthalene



B. P., °C @ 760mm
215–218 6–7[10]

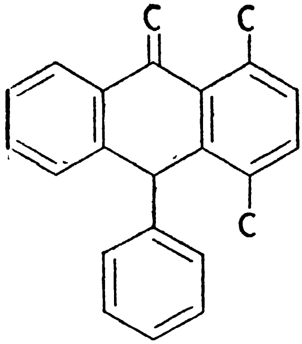
2-Methyl-4-o-biphenylyl-1,2-dihydronaphthalene



M. P., °C
77–78[10]

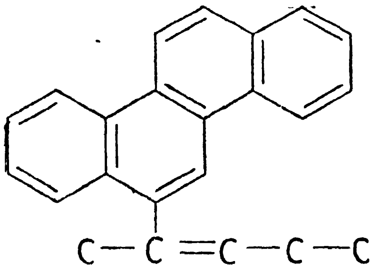
B. P., °C @ 760mm
218–220 8–9[10]

1,4-Dimethyl-9-methylene-10-phenyl-9,10-dihydroanthracene



M. P., °C
129[4]

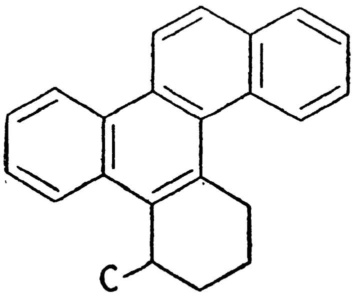
6-(2′-Penten-2′-yl)-chrysene



M. P., °C
102[7]

B. P., °C @ 760mm
210–215 0.1[7]

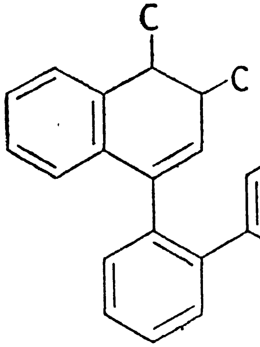
5,6-(6′-Methylcyclohexano)-chrysene



M. P., °C
139[7]

$C_{24}H_{22}$

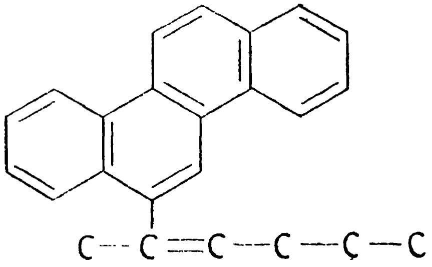
1,2-Dimethyl-4-o-biphenylyl-1,2-dihydronaphthalene



M. P., °C
78-79.5[10]

B. P., °C @ 760mm
217-218 8[10]

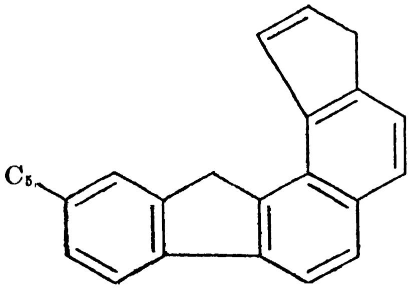
6-(2′-Hexen-2′-yl)-chrysene



B. P., °C @ 760mm
230-235 0.1[7]

$C_{25}H_{24}$

1,2-(4′,5′-Indo)-7-pentylfluorene (Diels' Hydrocarbon II) (a)

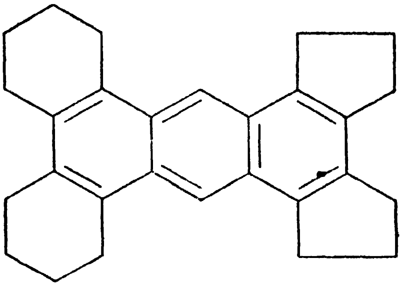


M. P., °C
220[18]
219[19]

(a) Although the above structure was assigned by Diels, it is not generally accepted as definite.

$C_{28}H_{30}$

1,2,3,4-Dicyclopentano-5,6,7,8-dicyclohexanoanthracene



M. P., °C
342-344[3]

References on Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-26}

1. Bachmann, W. E., and M. Carmack, J. Am. Chem. Soc. **63,** 1685 **1941.**
2. Bachmann, W. E., and S. R. Safir, J. Am. Chem. Soc. **63,** 2601 **1941.**
3. Backer, H. J., and L. H. H. Huisman, Rec. trav. chim. **60,** 557 **1941;** C. A. **37,** 5982 **1943.**
4. Barnett, E. de B., and J. A. Low, Ber. **64,** 49 **1931.**
5. Bartlett, P. D., M. J. Ryan, and S. G. Cohen, J. Am. Chem. Soc. **64,** 2649 **1942.**
6. Bergmann, E., and O. Blum-Bergmann, J. Am. Chem. Soc. **58,** 1678 **1936.**
7. Bergmann, F., and H. E. Eschinazi, J. Am. Chem. Soc. **65,** 1413 **1943.**
8. Bergmann, F., H. E. Eschinazi, and D. Schapiro, J. Am. Chem. Soc. **64,** 557 **1942.**
9. Bradsher, C. K., and L. Rapoport, J. Am. Chem. Soc. **65,** 1646 **1943.**
10. Bradsher, C. K., and L. Rapoport, J. Am. Chem. Soc. **66,** 1281 **1944.**

11. Buu-Hoï and P. Cagniant, Compt. rend. **216,** 346 **1943;** C. A. **38,** 3977 **1944.**
12. Crawford, H. M., J Am Chem. Soc. **61,** 608 **1939.**
13. Crawford, H. M., J. Am. Chem. Soc. **64,** 727 **1942.**
14. Cook, J. W., and C. G. M. DeWorms, J. Chem. Soc. **1939,** 268.
15. Cook, J. W., and W. Graham, J. Chem. Soc. **1944,** 329.
16. Courtot, C., Ann. chim. [9] **5,** 52 **1916.**
17. Dane, E., O. Hoss, A. W. Bindseil, and J. Schmitt, Ann. **532,** 39 **1937.**
18. Diels, O., W. Gadke, and P. Kording, Ann. **459,** 1 **1927.**
19. Diels, O., and A. Karstens, Ann. **478,** 129 **1930.**
20. Errera, G., Gazz. chim. ital. **38,** II, 588 **1908.**
21. Fecht, H., Ber. **40,** 3883 **1907.**
22. Fieser, L. F., and J. Cason, J. Am. Chem. Soc. **62,** 1293 **1940.**
23. Fieser, L. F., and M. Fieser, J. Am. Chem. Soc. **57,** 782 **1935.**
24. Fieser, L. F., M. Fieser, and E. B. Hershberg, J. Am. Chem. Soc. **58,** 1463 **1936.**
25. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **59,** 1028 **1937.**
26. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **62,** 49 **1940.**
27. Fieser, L. F., and M. S. Newman, J. Am. Chem. Soc. **57,** 1602 **1935.**
28. Fieser, L. F., and M A. Peters, J. Am. Chem. Soc. **54,** 4373 **1932.**
29. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **58,** 478 **1936.**
30. Gabriel, S., Ber. 17, 1389 **1884.**
31. Kon, G. A. R., and E. M. F. Roe, J. Chem. Soc. **1945,** 143.
32. Kovache, A., Ann. chim. [9] **10,** 184 **1918.**
33. Kuhn, R., and A. Winterstein, Helv. Chim. Acta **11,** 123 **1928.**
34. Lettre, H., H. Barnbeck, and W. Lege, Ber. **69,** 1151 **1936.**
35. Mikhaĭlov, B. M., and N. G. Chernova, J. Gen. Chem. (U.S.S.R.) **12,** 276 **1942;** C. A. **37,** 3083 **1943.**
36. Mills, W. H., and M. Mills, J. Chem. Soc. **101,** 2194 **1912.**
37. Mohler, H., and J. Sorge, Helv. Chim. Acta **22,** 229 **1939.**
38. Nierenstein, M., and C. W. Webster, J. Am. Chem. Soc. **67,** 691 **1945.**
39. Philippi, E., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **123,** Abt. IIb, 21 **1914.**
40. Pinkney, P. S., and C. S. Marvel, J. Am. Chem. Soc. **59,** 2669 **1937.**
41. Reddelien, G., J. prakt. Chem. [2] **91,** 213 **1915.**
42. Schlenk, W., and E. Bergmann, Ber. **62,** 745 **1929.**
43. Shear, M. J., Am. J. Cancer **28,** 334 **1936.**
44. Shuttleworth, R. G., W. S. Rapson, and E. T. Stewart, J. Chem. Soc. **1944,** 71.
45. Sieglitz, A , Ber. **52,** 1513 **1919.**
46. Thiele, J , Ber. **33,** 851 **1900.**
47. Thiele, J., and F. Heule, Ann. **347,** 290 **1906.**
48. Ullmann, F., and R. von Wurstemberger, Ber. **38,** 4105 **1905.**
49. Vollmann, H., H. Becker, M. Corell, and H. Streeck, Ann. **531,** 1 **1937.**
50. Weidlich, H. A., Ber. **71,** 1203 **1938.**
51. Weiss, R., and F. Müller, Monatsh. **65,** 129 **1934.**
52. Weizmann, C., and E. Bergmann, Scripta Academica Hierosolymitana (Jerusalem) Sci. Report No 1 **1938.**

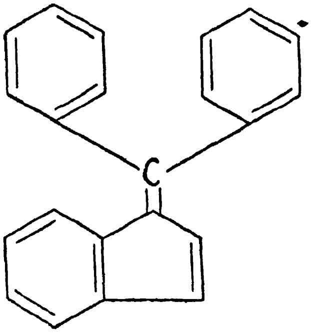
XI. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-28}

1. Indene Derivatives of Empirical Formula C_nH_{2n-28}
2. Naphthalene with Two Phenyl or One Biphenylyl Substitutions
3. Benzopyrenes and Their Alkyl Derivatives
4. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-28}

1. INDENE DERIVATIVES OF EMPIRICAL FORMULA C_nH_{2n-28}

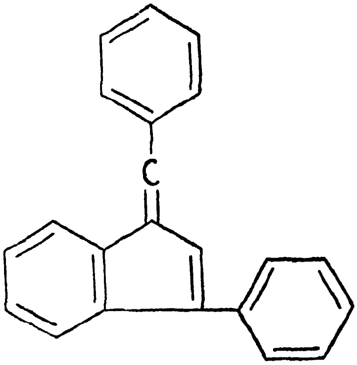
$C_{22}H_{16}$

1-Benzhydrylideneindene



M. P., °C
114.5[7]
111–112[2, 4]

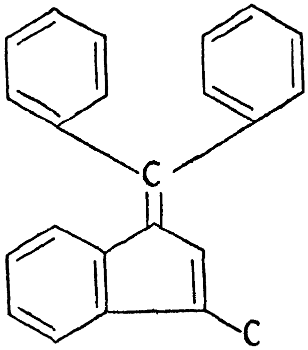
1-Benzylidene-3-phenylindene



M. P., °C
77.5[5]

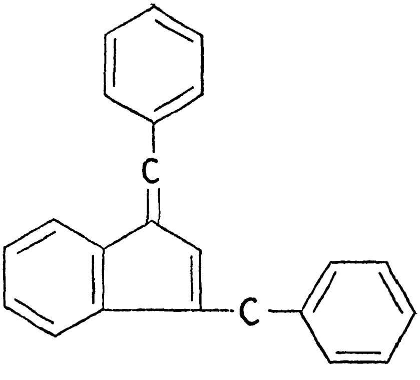
$C_{23}H_{18}$

1-Benzhydrylidene-3-methylindene



M. P., °C
120–121[9]

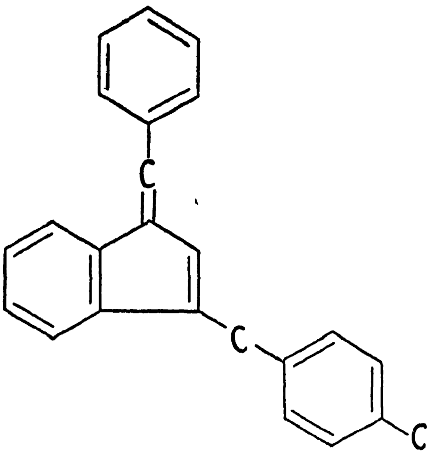
1-Benzylidene-3-benzylindene



M. P., °C
137–138[3]
137.5[8]
137–137.5[6]

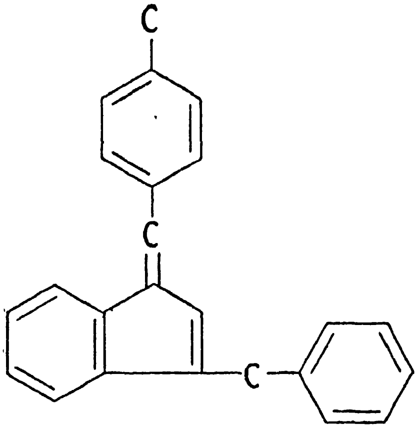
$C_{24}H_{20}$

1-Benzylidene-3-(4′-methylbenzyl)-indene



M. P., °C
106–107[1]

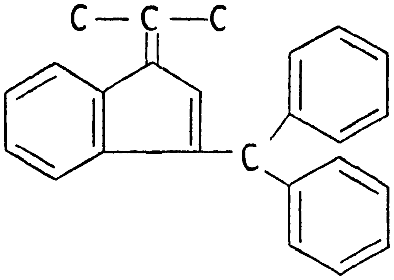
1-(4′-Methylbenzylidene)-3-benzylindene



M. P., °C
98–100[1]
94[8]

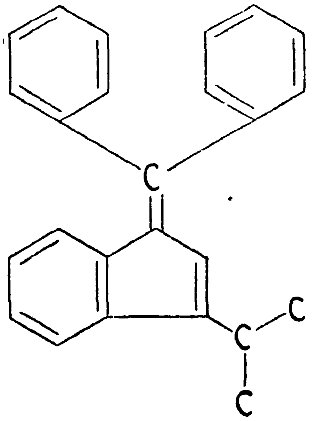
$C_{25}H_{22}$

1-Isopropylidene-3-benzyhydrylindene



M. P., °C
174–175[9]

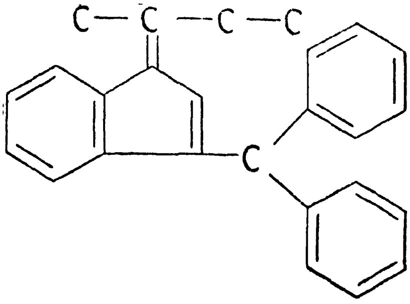
1-Benzhydrylidene-3-isopropylindene



M. P., °C
127–128[9]

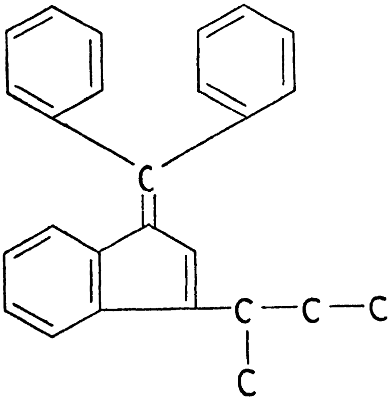
$C_{26}H_{24}$

1-*sec*-Butylidene-3-benzhydrylindene



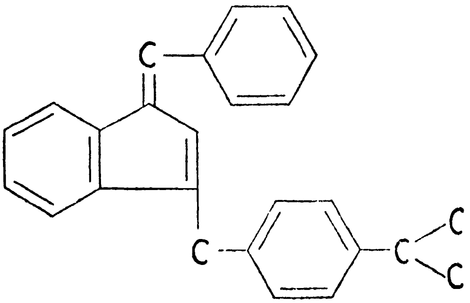
M. P., °C
149.5–151[9]

1-Benzhydrylidene-3-*sec*-butylindene



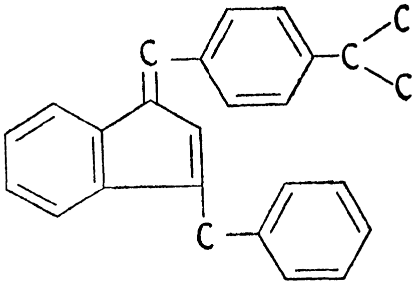
M. P., °C
91–92[9]

1-Benzylidene-3-(4′-isopropylbenzyl)-indene



M. P., °C
105–107[1]

1-(4′-Isopropylbenzylidene)-3-benzylindene



M. P., °C
93–94[1]

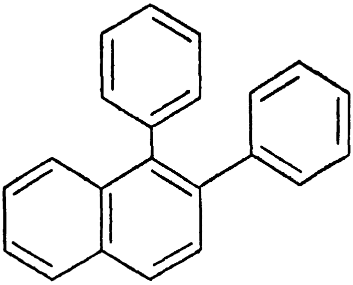
References on Indene Derivatives of Empirical Formula C_nH_{2n-28}

1. Bernthsen, W., Ann. **415,** 274 **1918.**
2. Courtot, C., Ann. chim. [9] **4,** 168 **1915.**
3. Courtot, C., Ann. chim. [9] **5,** 52 **1916.**
4. Grignard, V., and C. Courtot, Compt. rend. **152,** 272 **1911.**
5. Mayer, F., A. Sieglitz, and W. Ludwig, Ber. **54,** 1397 **1921.**
6. Thiele, J., and A. Bühner, Ann. **347,** 249 **1906.**
7. Thiele, J., and K. Merck, Ann. **415,** 257 **1918.**
8. Wislicenus, W., and W. Hentrich, Ann. **436,** 9 **1924.**
9. Wuest, H.-M., Ann. **415,** 291 **1918.**

2. NAPHTHALENE WITH TWO PHENYL OR ONE BIPHENYLYL SUBSTITUTIONS, C_nH_{2n-28}

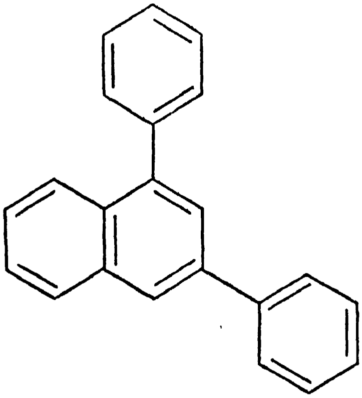
$C_{22}H_{16}$

1,2-Diphenylnaphthalene



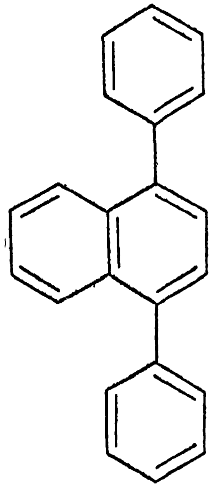
M. P., °C
114[5]
109.5-110[11]

1,3-Diphenylnaphthalene



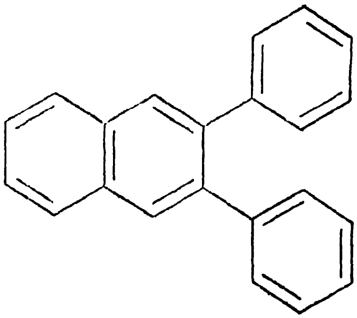
M. P., °C
70-71[11]

1,4-Diphenylnaphthalene



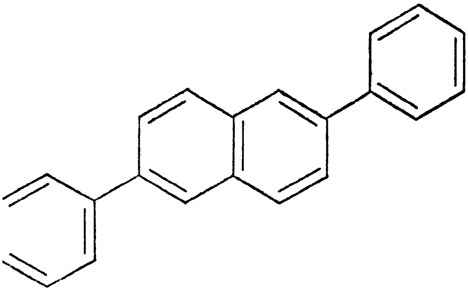
M. P., °C
135-137[36]
135-136[13, 14]
134-136[1]
133[31]
132-133[30]

2,3-Diphenylnaphthalene



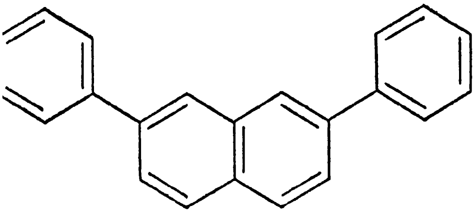
M. P., °C
86-87[11]

2,6-Diphenylnaphthalene



M. P., °C
233–234[31] 230[28]

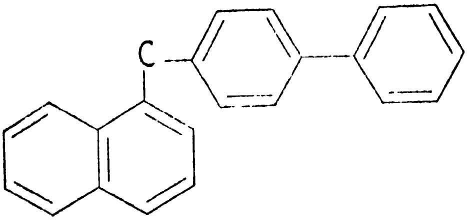
2,7-Diphenylnaphthalene



M. P., °C 143[21]

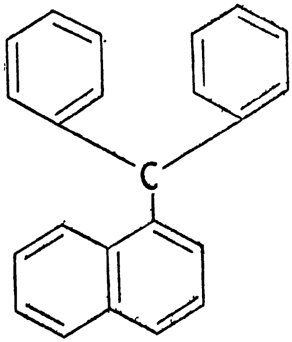
$C_{23}H_{18}$

1-Naphthyl-*p*-biphenylylmethane



M. P., °C 146[27]

1-Benzhydrylnaphthalene



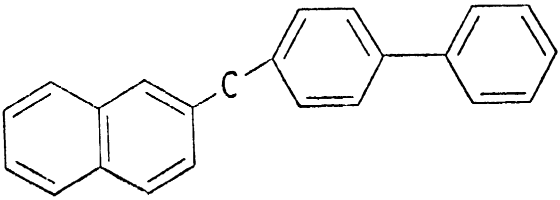
M. P., °C
150
152[25]
150.5[33, 34]
150 (a)
149.5[22]
149 (b)[6, 7, 8, 23]
148–149[10]
134 (b)[6, 7, 8, 23]

D_4^{20}
1.190 0°[37]

(a) The melting point 150 is found in references 1, 2, 3, 20, 24, 32, 38.

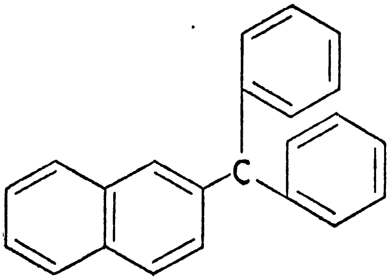
(b) These constants were determined on different crystalline forms.

2-Naphthyl-*p*-biphenylylmethane



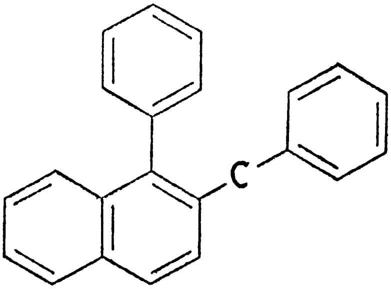
M. P., °C 111[26]

2-Benzhydrylnaphthalene



M. P., °C
77–78[19]
73–74[25]

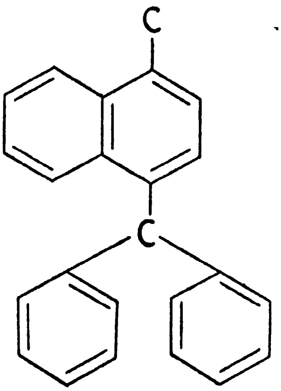
1-Phenyl-2-benzylnaphthalene



M. P., °C
87–88[9]

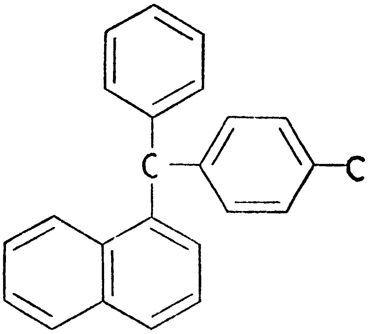
$C_{24}H_{20}$

1-Methyl-4-benzhydrylnaphthalene



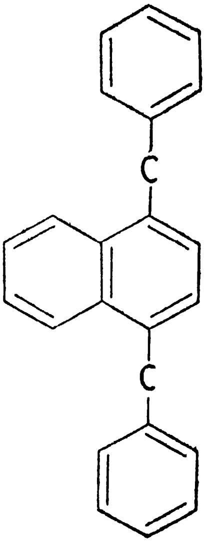
M. P., °C
149[6]

Phenyl-*p*-tolyl-1-naphthylmethane



M. P., °C
133[12]

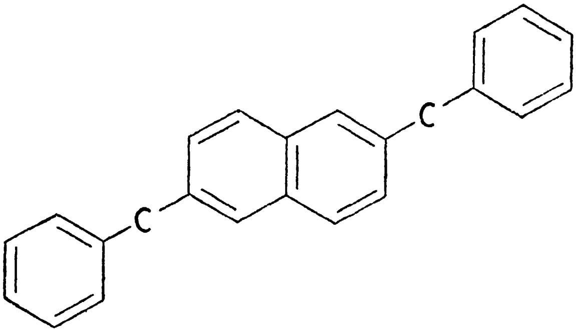
1, 4-Dibenzylnaphthalene



M. P., °C
88[15, 16, 17]

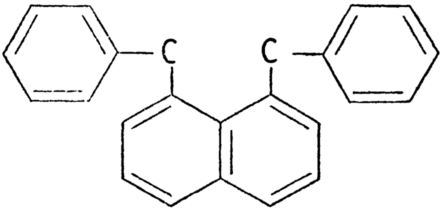
This series continued on next page

2, 6-Dibenzylnaphthalene



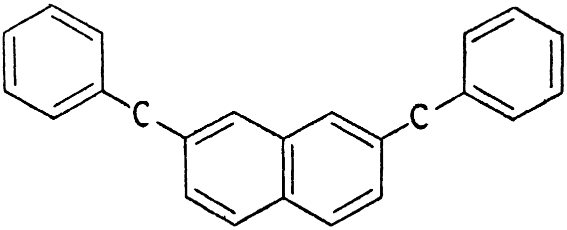
M. P., °C
123^{18}

1, 8-Dibenzylnaphthalene



M. P., °C
$146.5^{15, 16, 35}$

2, 7-Dibenzylnaphthalene



M. P., °C
91^{18}

---

x, x-Dibenzylnaphthalene (a)

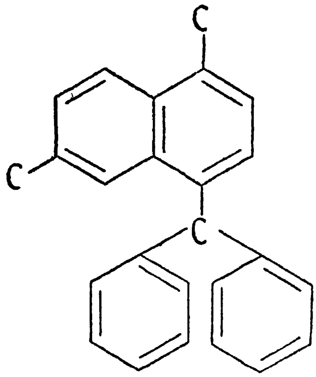
M. P., °C
132^{15}

B. P., °C @ 760mm
265–275 9^{29}

(a) The structure of this compound was not clearly defined in the literature.

$C_{25}H_{22}$

1,6-Dimethyl-4-benzhydrylnaphthalene



M. P., °C
134–135[6]

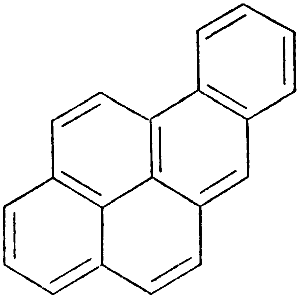
References on Naphthalene with Two Phenyl or One Biphenylyl Substitutions

1. Acree, S. F., Ber. **37,** 616 **1904.**
2. Acree, S. F., Ber. **37,** 625 **1904.**
3. Acree, S. F., Ber. **37,** 2753 **1904.**
4. Allen, C. F. H., and L. Gilman, J. Am. Chem. Soc. **58,** 937 **1936.**
5. Bergmann, F., H. E. Eschinazi, and D. Schapiro, J. Am. Chem. Soc. **64,** 557 **1942.**
6. Bistrzycki, A., and G. Krause, Helv. Chim. Acta **16,** 100 **1933.**
7. Bodroux, F., Bull. soc. chim. [4] **17,** 318 **1915.**
8. Bodroux, F., Compt. rend. **161,** 131 **1915.**
9. Borsche, W., P. Hofmann, and H. Kühn, Ann. **554,** 23 **1943.**
10. Bowden, S. T., and W. E. Harris, J. Chem. Soc. **1939,** 307.
11. Crawford, H. M., J. Am. Chem. Soc. **61,** 608 **1939.**
12. Dilthey, W., J. prakt. Chem. [2] **109,** 273 **1925.**
13. Dufraisse, C., and R. Priou, Bull. soc. chim. [5] **5,** 502 **1938.**
14. Dufraisse, C., and R. Priou, Bull. soc. chim. [5] **5,** 611 **1938.**
15. Dziewoński, K., and J. Moszew, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1928A,** 283.
16. Dziewoński, K., and J. Moszew, Roczniki Chem. **11,** 169 **1931;** C.A. **26,** 131 **1932:** Chem. Zentr. **1931,** I, 2875.
17. Dziewoński, K., J. Moszew, S. Lepiankiewicz, and L. Sucheni, Bull. intern. acad. polon. sci., Classe sci. math-nat. **1929A,** 950.
18. Dziewoński, K., and S. Wodelski, Roczniki Chem. **12,** 366 **1932;** C.A. **27,** 2145 **1933.**
19. Gomberg, M., and F. W. Sullivan, Jr., J. Am. Chem. Soc. **44,** 1810 **1922.**
20. Hemilian, V., Ber. **13,** 678 **1880.**
21. Hey, D. H., and S. E. Lawton, J. Chem. Soc. **1940,** 374.
22. Ipatieff, V. N., and B. N. Dolgov, Bull. soc. chim. [4] **45,** 950 **1929.**
23. Lehne, A., Ber. **13,** 358 **1880.**
24. McKenzie, A., and W. S. Dennler, J. Chem. Soc. **125,** 2105 **1924.**
25. McMullen, T. C., J. Am. Chem. Soc. **44,** 2055 **1922.**
26. Migita, M., Bull. Chem. Soc. Japan **7,** 382 **1932.**
27. Migita, M., Bull. Chem. Soc. Japan **8,** 22 **1933.**
28. Pokrovskaya, E. S., and T. G. Stepanseva, J. Gen. Chem. (U. S. S. R.) **9,** 1953 **1939;** C.A. **34,** 4731 **1940.**
29. Price, C. C., and J. M. Ciskowski, J. Am. Chem. Soc. **60,** 2199 **1938.**
30. Price, C. C., H. M. Shafer, M. F. Huber, and C. Bernstein, J. Org. Chem. **7,** 517 **1942.**
31. Price, C. C., and A. T. Tomisek, J. Am. Chem. Soc. **65,** 439 **1943.**
32. Ullmann, F., and A. Murav'ev-Vinogradov, Ber. **38,** 2213 **1905.**
33. Vansheidt, A., and B. Moldavski, Ber. **64,** 917 **1931.**
34. Vansheidt, A., and B. Moldavski, J. Gen. Chem. (U. S. S. R.) **1,** 304 **1931;** Chem. Zentr. **1931,** II, 3208.
35. von Bogusky, J. J., Ber. **39,** 2866 **1906.**
36. Weiss, R., and A. Abeles, Monatsh. **61,** 162 **1932.**
37. Ziegler, K., and F. Ditzel, Ann. **473,** 194 **1929.**
38. Zsuffa, M., Ber. **43,** 2915 **1910.**

3. BENZOPYRENES AND THEIR ALKYL DERIVATIVES, C_nH_{2n-28}

$C_{20}H_{12}$

1,2-Benzopyrene



M. P., °C

177.8
178.6–179.8[2]
178.8–179.3[10]
178.5–179[8]
178.5–179 (a)[18]
176.5–177.5[5, 14]
176.5–177.5 (a)[17]
177[22, 23]
176.5–177[7]
176.3–177.0[6]
175.5–176.5[14]
176[24]
174–176 (a)[15]
175[19]

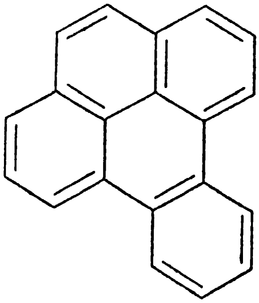
D_4^{20}

1.351 (solid)[12]
1.282 (b) (solid)[12]

(a) This compound was given as 1,2-Benzopyrene in the literature, but no structural formula or indication of the numbering system used was given.

(b) The temperature of this determination was not given.

4,5-Benzopyrene

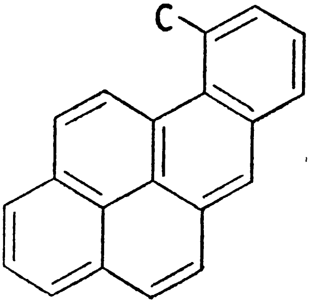


M. P., °C

178–179[5]
178[4]
174[11]

$C_{21}H_{14}$

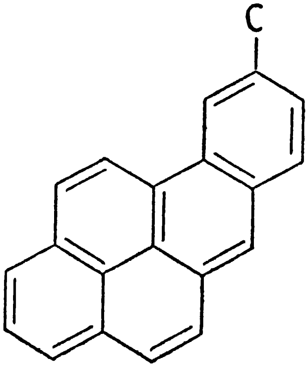
1,2-(3′-Methylbenzo)-pyrene



M. P., °C

190–191[13]
190–190.8[1]

1,2-(4′-Methylbenzo)-pyrene

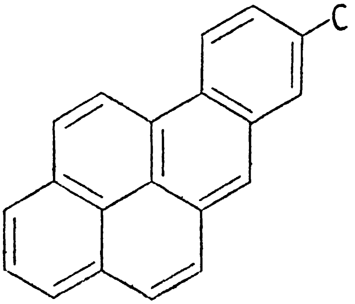


M. P., °C
139–140 (a)[1]
138–139 (b)[8]

B. P., °C @ 760mm
175 0.01[1]

(a) This compound remelts at 140–140.4.
(b) This compound remelts at 140–140.2.

1,2-(5′-Methylbenzo)-pyrene

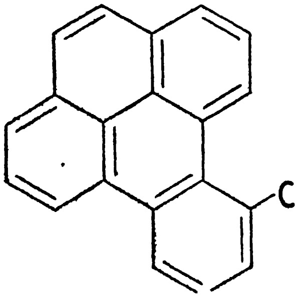


M. P., °C
147.5–148 (a)[1]
146.5–147.5[8]
146.5–147 (a)[8]

B. P., °C @ 760mm
220 0.01[1]

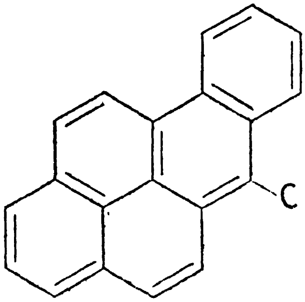
(a) This compound remelts at 147.6–148.1.

4,5-(3′-Methylbenzo)-pyrene



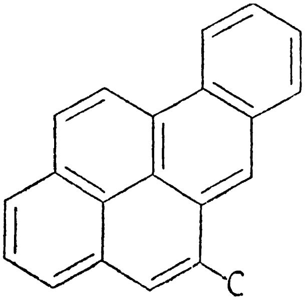
M. P., °C
219.5–220[10]
217.5–218[10]

3-Methyl-1,2-benzopyrene



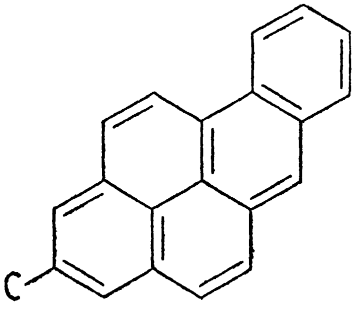
M. P., °C
216.6–217.3[6]
216.2–216.7[9]
215.7–216.2[9]

4-Methyl-1,2-benzopyrene



M. P., °C
171–172.5[16]
171–172[20]
171–171.5[9]

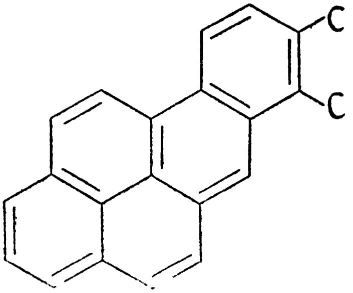
7-Methyl-1,2-benzopyrene



M. P., °C
157.5–159.5[8]

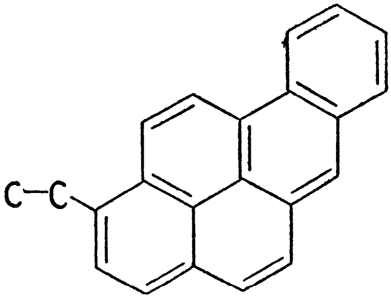
$C_{22}H_{16}$

1,2-(5′,6′-Dimethylbenzo)-pyrene



M. P., °C
215–216[1]

8-Ethyl-1,2-benzopyrene



M. P., °C
112[21]

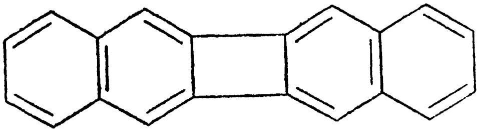
References on Benzopyrenes and Their Alkyl Derivatives

1. Bachmann, W. E., and M. Carmack, J. Am. Chem. Soc. **63,** 2494 **1941.**
2. Bachmann, W. E., M. Carmack, and S. R. Safir, J. Am. Chem. Soc. **63,** 1682 **1941.**
3. Bergmann, E., and O. Blum-Bergmann, J. Am. Chem. Soc. **58,** 1678 **1936.**
4. Clar, E., Ber. **76,** 609 **1943.**
5. Cook, J. W., C. L. Hewett, and I. Hieger, J. Chem. Soc. **1933,** 395.
6. Davis, W. W., M. E. Krahl, and G. H. A. Clowes, J. Am. Chem. Soc. **62,** 3080 **1940.**
7. Fieser, L. F., and M. Fieser, J. Am. Chem. Soc. **57,** 782 **1935.**
8. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **60,** 1658 **1938.**
9. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **60,** 2512 **1938.**
10. Fieser, L. F., and M. S. Newman, J. Am. Chem. Soc. **57,** 1602 **1935.**
11. Ghigi, E., Atti congr. intern. chim. 10th Congr. Rome **3,** 178 **1939;** C.A. **33,** 9318 **1939;** Chem. Zentr. **1939,** II, 3984.
12. Iball, J., Z. Krist. **94,** 7 **1936;** C.A. **30,** 7412 **1936;** Chem. Zentr. **1936,** II, 3293.
13. Kon, G, A. R., and E. M. F. Roe, J. Chem. Soc. **1945,** 143.
14. Mayneord, W. V., and E. Roe, Biochem. J. **30,** 707 **1936.**
15. Miescher, G., F. Almasy, and K. Kläui, Biochem. Z. **287,** 189 **1936.**
16. Mohler, H., and J. Sorge, Helv. Chim. Acta **22,** 229 **1939.**
17. Sannié, C., Biochem. J. **30,** 704 **1936.**
18. Shear, M. J., Am J. Cancer **26,** 322 **1936.**
19. Vollmann, H , H. Becker, M. Corell, and H. Streeck, Ann. **531,** 1 **1937.**
20. Weizmann, C., and E. Bergmann, Scripta Academica Hierosolymitana (Jerusalem) Sci. Report No. 1 **1938.**
21. Windaus, A., and K. Raichle, Ann. **537,** 157 **1939.**
22. Winterstein, A., and K. Schön, Z. physiol. Chem. **230,** 146 **1934.**
23. Winterstein, A., and H. Vetter, Z. physiol. Chem. **230,** 169 **1934.**
24. Winterstein, A., H. Vetter, and K. Schon, Ber. **68,** 1079 **1935.**

4. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-28}

$C_{20}H_{12}$

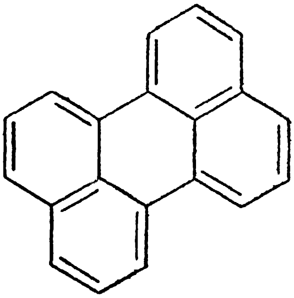
1,2,3,4-Di-(3',2'-naphtho)-cyclobutane



M. P., °C

365 ± 2^{50}

Perylene



M. P., °C

275

$277.9\text{–}279.1^{26}$

279^{49}

278^{46}

274^{33}

$273\text{–}274^{44}$

273^{63}

$272\text{–}273^{25}$

271^{64}

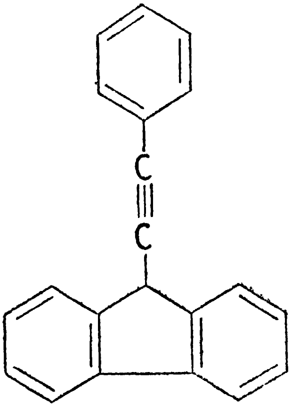
267^{48}

266^{12}

265^{38}

$C_{21}H_{14}$

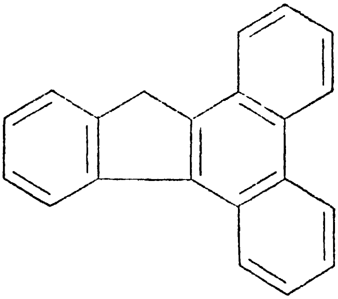
Phenyl-(9'-fluoryl)-ethyne



M. P., °C

$98\text{–}100^{34}$

1,2,3,4-Dibenzofluorene



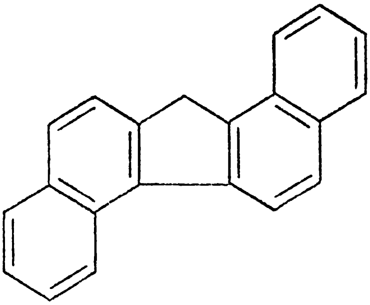
M. P., °C

$158\text{–}160^{57}$

$158\text{–}159^{7}$

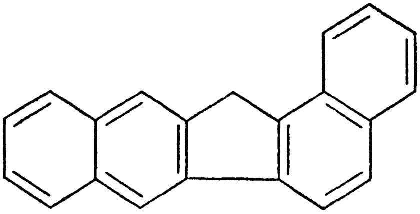
$157.5\text{–}158.5^{43}$

1,2,5,6-Dibenzofluorene



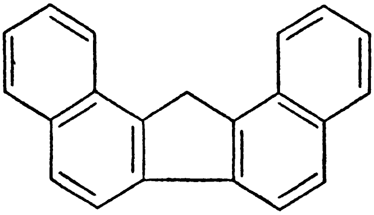
M. P., °C
171-172[21]

1,2,6,7-Dibenzofluorene



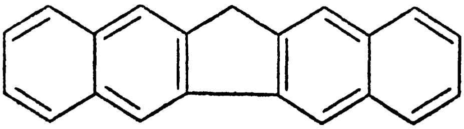
M. P., °C
294[24]

1,2,7,8-Dibenzofluorene



M. P., °C
242.5[53]
234[13]
232[14]
230[10]
228-230[36]

2,3,6,7-Dibenzofluorene



M. P., °C
282.5-283.5[42]
281-282[24]

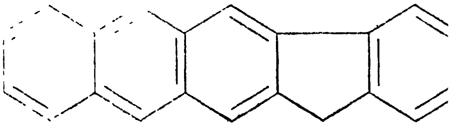
---

x,x,x,x-Dibenzofluorene (a)

M. P., °C
306[4]
190.5[52]

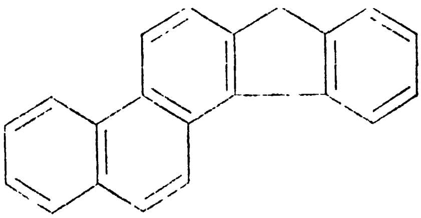
(a) The structure of these compounds was not clearly defined in the literature.

2,3-(3',2'-Indo)-anthracene



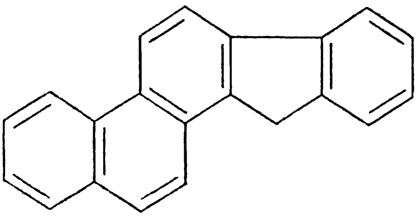
M. P., °C
317[5]

1,2-(3',2'-Indo)-phenanthrene



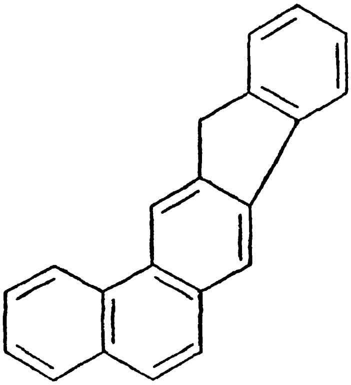
M. P., °C
189[11]

1,2-(2',3'-Indo)-phenanthrene



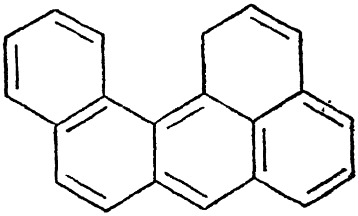
M. P., °C
338-339[20]
328[2]
327-328[22, 23]

2,3-(3′,2′-Indo)-phenanthrene



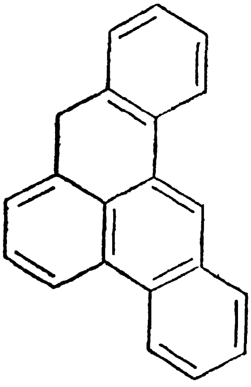
M. P., °C
$226\text{–}226.5^{21}$

8,9-(2′, 1′-Naphtho)-phenalene



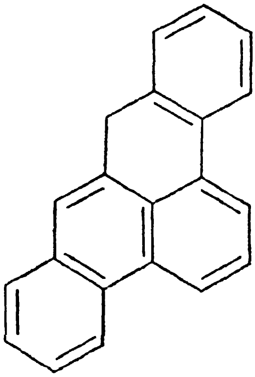
M. P., °C
$149\text{–}149.5^{28A}$

2,3,5,6-Dibenzophenalene



M. P., °C
$128\text{–}129^{15}$

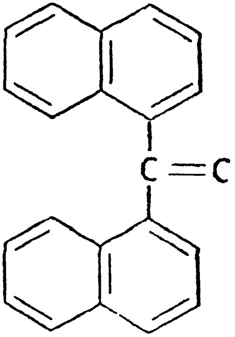
2,3,7,8-Dibenzophenalene



M. P., °C
$171\text{–}172.5^{15}$

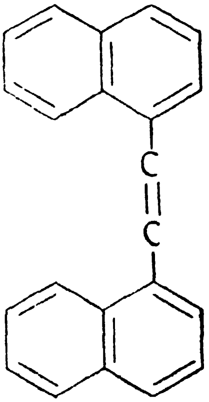
$C_{22}H_{16}$

1,1-Di-(1′-naphthyl)-ethene



M. P., °C
107^{47}

1,2-Di-(1′-naphthyl)-ethene



M. P., °C

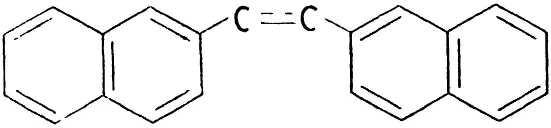
161–162[54]

161[8, 28, 61]

160[45]

158.5–159[30]

1,2-Di-(2′-naphthyl)-ethene



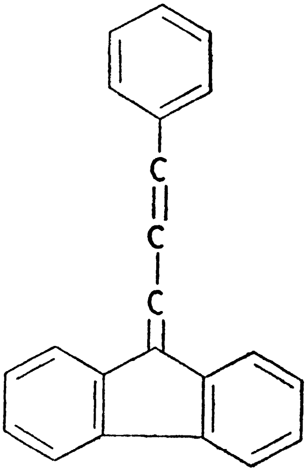
M. P., °C

255[61]

254–255[29, 60]

253–254[54]

1-Phenyl-3-(9′-fluorylidene)-propene-1



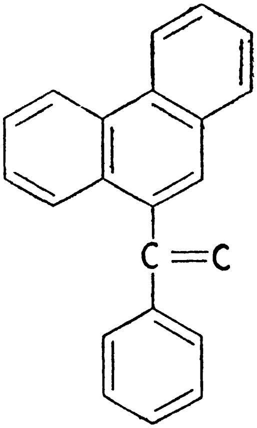
M. P., °C

155[35]

154–155[62]

154.5[55]

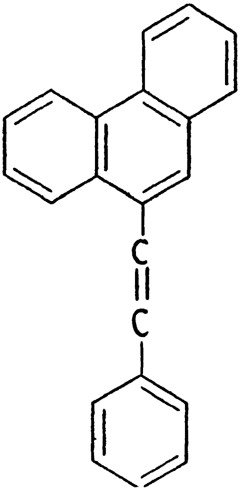
1-Phenyl-1-(9′-phenanthryl)-ethene



M. P., °C

142[6]

1-Phenyl-2-(9′-phenanthryl)-ethene



M. P., °C
118[6]

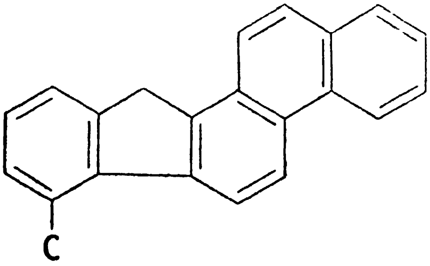
---

x-Phenyl-x, x-dihydrobenzo-[jk]-fluorene (a)

M. P., °C
148[56]

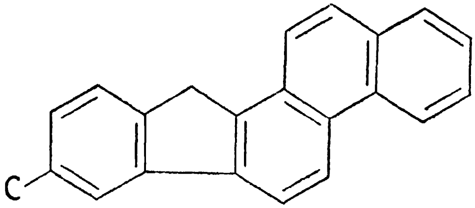
(a) The structure of this compound was not clearly defined in the literature.

1,2-(2′,1′-Naphtho)-5-methylfluorene



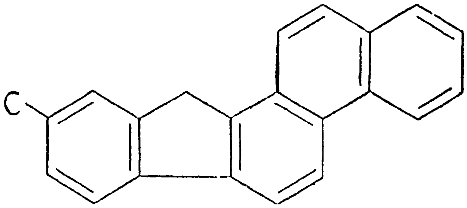
M. P., °C
275–276[2]
275[51]

1,2-(2′,1′-Naphtho)-6-methylfluorene



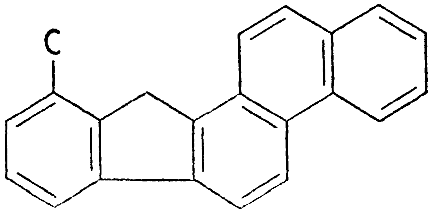
M. P., °C
330[2]

1,2-(2′,1′-Naphtho)-7-methylfluorene



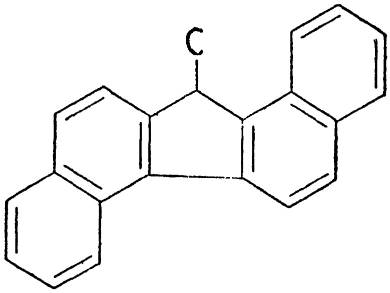
M. P., °C
334–336[2]
301[13]

1,2-(2′,1′-Naphtho)-8-methylfluorene



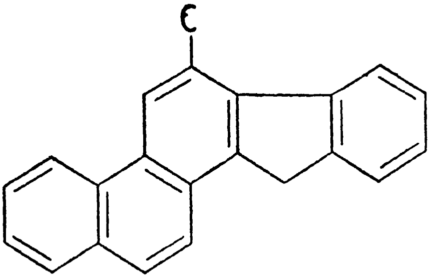
M. P., °C
281–281.5[2]

1,2,5,6-Dibenzo-9-methylfluorene



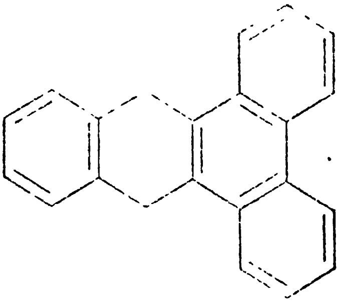
M. P., °C
144–145[21]

1,2-(2′,3′-Indo)-3-methylphenanthrene



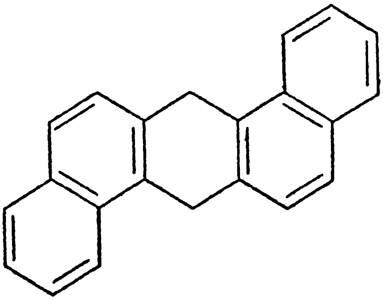
M. P., °C
202–203[2]

1,2,3,4-Dibenzo-9,10-dihydroanthracene



M. P., °C
202–203[3]

1,2,5,6-Dibenzo-9,10-dihydroanthracene



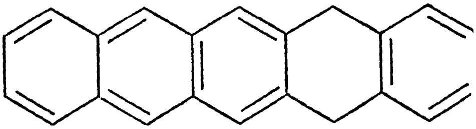
M. P., °C
218.5–219.5[1]
196–198[19]

1,2-Benzo-x,x-dihydronaphthacene (a)

M. P., °C
157–160.5[8]

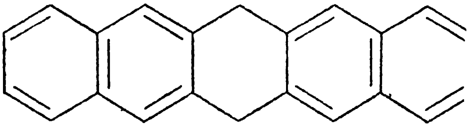
(a) The hydrogens may be in either the 5,8- or 9,10-positions.

5,14-Dihydropentacene



M. P., °C
273[16]

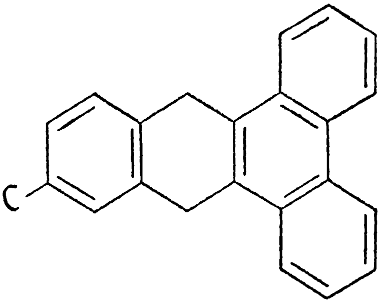
6,13-Dihydropentacene



M. P., °C
271–272[41]
270[17, 39, 40]

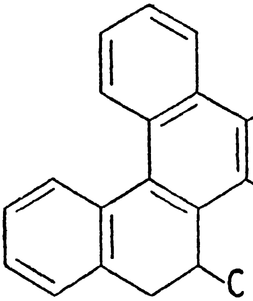
$C_{23}H_{18}$

1,2,3,4-Dibenzo-6-methyl-9,10-dihydroanthracene



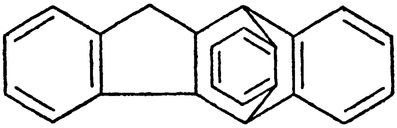
M. P., °C
207–209.5[8]

11,12-Benzo-5-methyl-5,6-dihydrochrysene



M. P., °C
151–152[9]

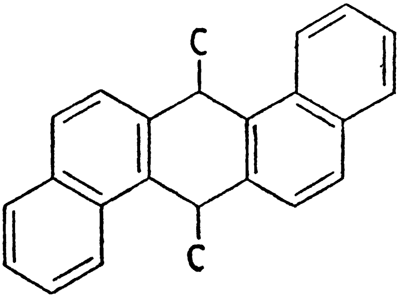
1,4-*o*-Endophenylene-2,3-benzo-1,4,4a,9a-tetrahydrofluorene



M. P., °C
118[37]

$C_{24}H_{20}$

1,2,5,6-Dibenzo-9,10-dimethyl-9,10-dihydroanthracene

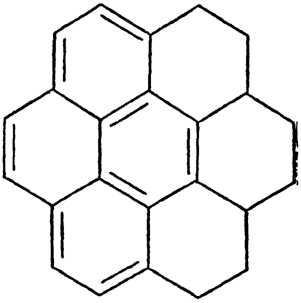


M. P., °C
277–278 (a)[18]
207–209 (b)[18]

(a) This constant was determined on the *trans* isomer of the compound.

(b) This constant was determined on the *cis* isomer of the compound.

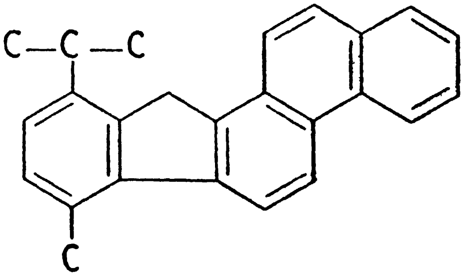
1,2,2a,3,4,4a,5,6-Octahydrocoronene



M. P., °C
269–270[30]

$C_{25}H_{22}$

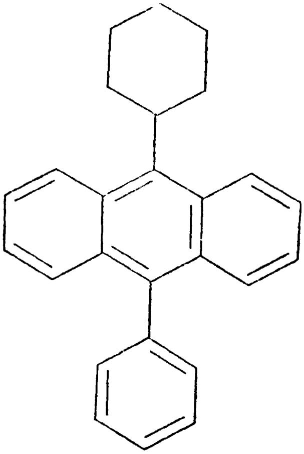
1,2-(2′,1′-Naphtho)-5-methyl-8-isopropylfluorene



M. P., °C
198[22, 23]

$C_{26}H_{24}$

9-Cyclohexyl-10-phenylanthracene



M. P., °C
231–232[58, 59]

$C_{27}H_{26}$

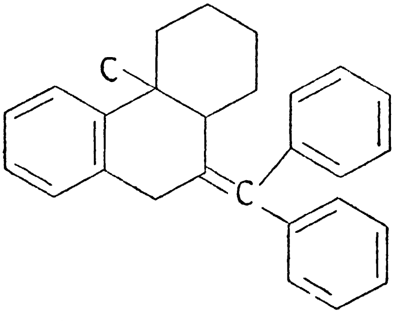
2,7-Dibenzyl-x$_4$-tetrahydrofluorene (a)

M. P., °C
90–91[27]

(a) The structure of this compound was not clearly defined in the literature.

$C_{28}H_{28}$

4a-Methyl-10-benzhydrylidene-1,2,3,4,4a,9,10,10a-octahydrophenanthrene



M. P., °C
126[31]

$C_{30}H_{32}$

1-Methyl-7-isopropyl-x,x-diphenyl-x$_6$-hexahydrophenanthrene (a)

M. P., °C
82[32]

(a) The structure of this compound was not clearly defined in the literature.

References on Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-28}

1. Bachmann, W. E., J. Org. Chem. **1**, 317 **1936-37.**
2. Bachmann, W. E., J. W. Cook, C. L. Hewett, and J. Iball, J. Chem. Soc. **1936**, 54.
3. Bachmann, W. E., and L. H. Pence, J. Am. Chem. Soc. **59**, 2339 **1937.**
4. Bamberger, E., and F. D. Chattaway, Ann. **284**, 52 **1895.**
5. Barnett, E. de B., N F. Goodway, and J. W. Watson, Ber. **66**, 1876 **1933.**
6. Bergmann, E., and F. Bergmann, J. Am. Chem. Soc. **59**, 1443 **1937.**
7. Bergmann, E , and F. Bergmann, J. Am. Chem. Soc. **60**, 1805 **1938.**
8. Billows, E., Rivista min. crist. ital. **30**, 31 **1903.**
9. Bradsher, C. K., and L. Rapoport, J. Am. Chem. Soc. **66**, 1281 **1944.**
10. Buu-Hoi and P. Cagniant, Compt. rend. **216**, 299 **1943**; C.A. **38**, 2330 **1944.**
11. Buu-Hoi and P. Cagniant, Rev. sci. **80**, 319 **1942**; C A. **39**, 3276 **1945.**
12. Calcott, W. S., J. M. Tinker, and V. Weinmayr, J. Am. Chem. Soc. **61**, 949 **1939.**
13. Chichibabin, A. E., and O. I. Magidson, J. prakt. Chem. [2] **90**, 168 **1914.**
14. Chichibabin, A., and O. Magidson, J. Russ. Phys. Chem. Soc. **46**, 1389 **1914**; Chem. Zentr. **1915**, I, 1123.
15. Clar, E., Ber. **76**, 609 **1943.**
16. Clar, E., and F. John, Ber. **62**, 3021 **1929.**
17. Clar, E.. and F. John, Ber. **63**, 2967 **1930.**
18. Cook, J. W., J. Chem. Soc. **1931**, 489.
19. Cook, J. W., J. Chem. Soc. **1933**, 1592.
20. Cook, J. W., J. Chem. Soc. **1941**, 685.
21. Cook, J. W., A. Dansi, C. L. Hewett, J. Iball, W. V. Mayneord, and E. Roe, J. Chem. Soc. **1935**, 1319.

22. Cook, J. W., C. L. Hewett, W. V. Mayneord, and E. Roe, J. Chem. Soc. **1934,** 1727.

23. Cook, J. W., C. L. Hewett, W. V. Mayneord, and E. Roe, J. Soc. Chem. Ind. **53,** 569 **1934.**

24. Cook, J. W., and R. W. G. Preston, J. Chem. Soc. **1944,** 553.

25. Corbellini, A., and F. Steffenoni, Rend. ist. lombardo sci. [2] **69,** 429 **1936;** Chem. Zentr. **1937,** I, 1120.

26. Davis, W. W., M. E. Krahl, and G. H. A. Clowes, J. Am. Chem. Soc. **62,** 3080, **1940.**

27. Dziewoński, K., M. Dominikowna, L. Galuszkowna, and W. Muz, Roczniki Chem. **13,** 283 **1933;** C.A. **27,** 4533 **1933;** Chem. Zentr. **1933,** II, 1521.

28. Elbs, K., J. prakt. Chem. [2] **47,** 44 **1893.**

28A. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc **58,** 478 **1936.**

29. Friedmann, W., Ber. **49.** 1352 **1916.**

30. Fromherz, H., L. Thaler, and G. Wolf, Z. Elektrochem. **49,** 387 **1943.**

31. Grewe, R., Ber. **76,** 1076 **1943.**

32. Heiduschka, A., and H. Grimm, Arch. Pharm. **250,** 33 **1912.**

33. Hertel, E., and H. W. Bergk, Z. physik. Chem. **33B,** 319 **1936.**

34. Hurd, C. D., and F. L. Cohen, J. Am. Chem. Soc. **53,** 1068 **1931.**

35. Kuhn, R., and A. Winterstein, Helv. Chim. Acta **11,** 116 **1928.**

36. Magidson, O. I., Ber. **58,** 433 **1925.**

37. Mameli, E., Gazz. chim. ital. **67,** 669 **1937.**

38. Marschalk, C., Bull. soc. chim. [4] **43,** 1388 **1928.**

39. Marschalk, C., Bull soc. chim. [5] **4,** 1381 **1937.**

40. Marschalk, C., Bull. soc. chim. [5] **4,** 1535 **1937.**

41. Marschalk, C., Bull. soc. chim [5] **5,** 156 **1938.**

42. Martin, R. H., J. Chem. Soc. **1941,** 679.

43. Mohler, H., and J. Sorge, Helv. Chim. Acta **22,** 229 **1939.**

44. Morgan, G. T., and J. G. Mitchell, J. Chem. Soc. **1934,** 536.

45. Nenitzescu, C. D., and D. A. Isăcescu, Ber. **63,** 2484 **1930.**

46. Pestemer, M., and J. Cecelsky, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **140,** Abt. IIb, 511 **1931.**

47. Pfeiffer, P., and P. Schneider, J. prakt Chem. [2] **129,** 129 **1931.**

48. Pongratz, A., and A. Halabarda, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **139,** Abt. IIb, 433 **1930.**

49. Ràdulescu, D., G. Ostrogovich, and F. Barbulescu, Ber. **34,** 2240 **1931.**

50. Rosenhauer, E., F. Braun, R. Pummerer, and G. Riegelbauer, Ber. **70,** 2281 **1937.**

51. Ruzicka, L., and M. W. Goldberg, Helv. Chim. Acta **20,** 1215 **1937.**

52. Schmidlin, J., and M. Huber, Ber. **43,** 2821 **1910.**

53. Schmidlin, J., and P. Mossini, Ber. **42,** 2377 **1909.**

54. Szperl, L., Roczniki Chem. **1923,** II, 291; C.A. **18,** 1290 **1924.**

55. Thiele, J., and F. Henle, Ann. **347,** 290 **1906.**

56. von Braun, J., and G. Manz, Ber. **70,** 1603 **1937.**

57. Weizmann, C., and E. Bergmann, Scripta Academica Hierosolymitana (Jerusalem) Sci. Report No. 1 **1938.**

58. Willemart, A., Bull. soc. chim. [5] **6,** 204 **1939.**

59. Willemart, A., Compt. rend. **207,** 536 **1938.**

60. Wislicenus, W., and H. Wren, Ber. **38,** 502 **1905.**

61. Wood, J. H., J. A. Bacon, A. W. Meibohm, W. H. Throckmorton, and G. P. Turner, J. Am. Chem. Soc. **63,** 1334 **1941.**

62. Ziegler, K., and F Crossmann, Ann. **511,** 89 **1934.**

63. Zinke, A., F. Stimler, and E. Reuss, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **143,** Abt. IIb, 329 **1936.**

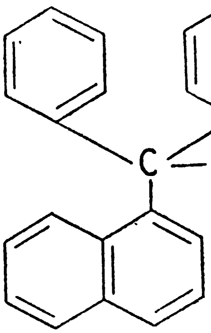
64. Zinke, A., and H. Troger, Ber. **74,** 107 **1941.**

XII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-28}

XII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-29}

$C_{23}H_{17}$

Diphenyl-(1-naphthyl)-methyl



M. P., °C
135–137[1, 2]

References on Polynuclear Aromatics of Empirical Formula C_nH_{2n-29}

1. Gomberg, M., and C. S. Schoepfle, J. Am. Chem. Soc. **39**, 1652 **1917**.
2. Gomberg, M., and C. Schoepfle, J. Am. Chem. Soc. **41**, 1655 **1919**.

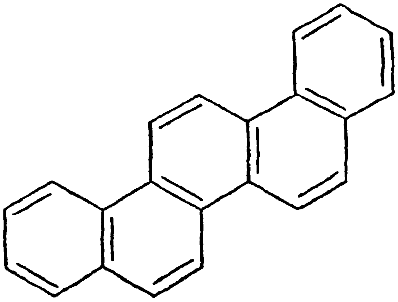
XIII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-30}

1. Picene and Its Alkyl Derivatives
2. Dibenzoanthracenes, Dibenzophenanthrenes, and Their Alkyl Derivatives
3. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-30}

1. PICENE AND ITS ALKYL DERIVATIVES, C_nH_{2n-30}

$C_{22}H_{14}$

Picene

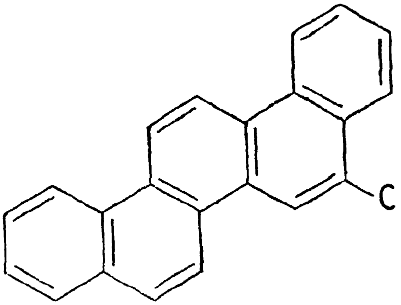


M. P., °C
365
366.0-366.5[6]
365-366[11,14,18]
363.5-364.5[3]
364[1,2,16]

B. P., °C @ 760mm
518-520[4]

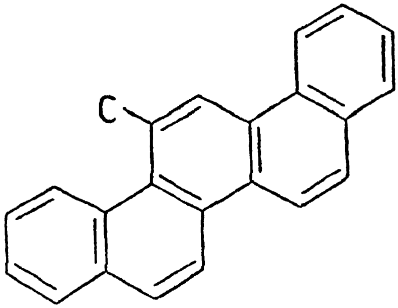
$C_{23}H_{16}$

5-Methylpicene



M. P., °C
251.6-252.2[6]

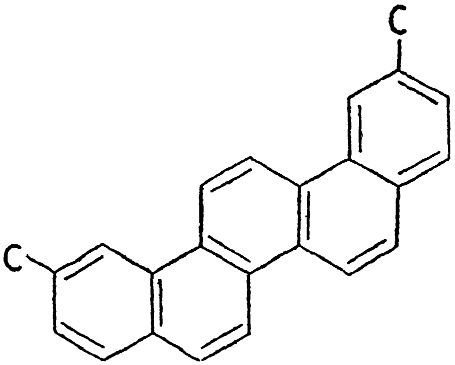
13-Methylpicene



M. P., °C
203.6-204.4[6]

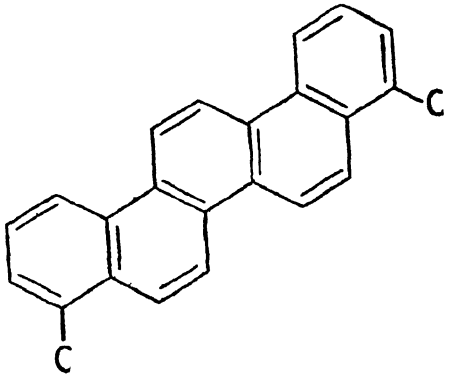
$C_{24}H_{18}$

2,11-Dimethylpicene



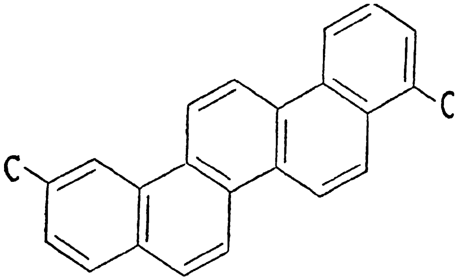
M. P., °C
293-294[12]

4,9-Dimethylpicene



M. P., °C
380-381[10]
370-371[7]

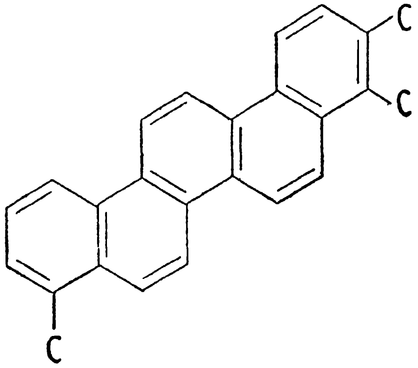
4, 11-Dimethylpicene



M. P., °C
306[10, 13]
305-306[8, 9]

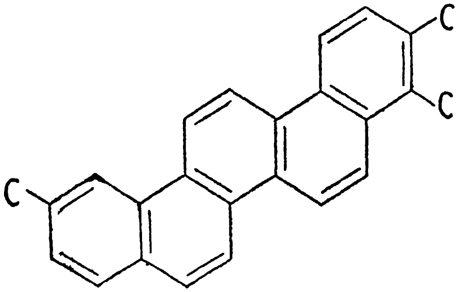
$C_{25}H_{20}$

3, 4, 9-Trimethylpicene



M. P., °C
380-381[10]
372-373[7]

3, 4, 11-Trimethylpicene



M. P., °C
309-310[10]
308-310[12]

B. P., °C @ 760mm
270 0.1[12]

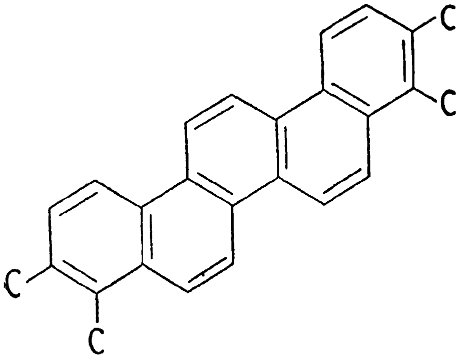
x, x, x-Trimethylpicene (a)

M. P., °C
306[15]
305-306[17]
298[5]

(a) The structure of this compound was not clearly defined in the literature.

$C_{26}H_{22}$

3, 4, 9, 10-Tetramethylpicene



M. P., °C
400-401[10]

References on Picene and Its Alkyl Derivatives

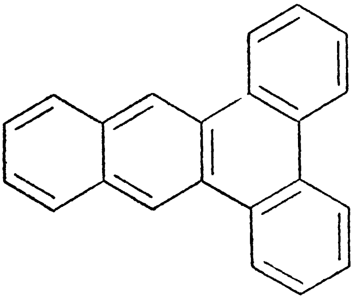
1. Bamberger, E., and F. D. Chattaway, Ann. **284**, 52 **1895**.
2. Bamberger, E., and F. Chattaway, Ber. **26**, 1751 **1893**.
3. Davis, W. W., M. E. Krahl, and G. H. A. Clowes, J. Am. Chem. Soc. **62**, 3080 **1940**.
4. Graebe, C., and J. Walter, Ber. **14**, 175 **1881**.
5. Jacobs, W., and O. Isler, J. Biol. Chem. **119**, 155 **1937**.
6. Newman, M. S., J. Org. Chem. **9**, 518 **1944**.

7. Ruzicka, L., M. Goldberg, and K. Hofmann, Helv. Chim. Acta **20,** 325 **1937.**
8. Ruzicka, L., A. Grob, and G. Anner, Helv. Chim. Acta **26,** 254 **1943.**
9. Ruzicka, L., and K. Hofmann, Helv. Chim. Acta **20,** 1155 **1937.**
10. Ruzicka, L., and K. Hofmann, Helv. Chim. Acta **22,** 126 **1939.**
11. Ruzicka, L., and H. Hosli, Helv. Chim. Acta **17,** 470 **1934.**
12. Ruzicka, L., and E. Mörgeli, Helv. Chim. Acta **19,** 377 **1936.**
13. Ruzicka, L., H. Schellenberg, and M. W. Goldberg, Helv. Chim. Acta **20.** 791 **1937.**
14. Ruzicka, L., G. Thomann, E. Brandenberger, M. Furter, and M. W. Goldberg, Helv. Chim. Acta **17,** 200 **1934.**
15. Spring, F. S., and T. Vickerstaff, J. Chem. Soc. **1937,** 249.
16. Weidlich, H. A., Ber. **71,** 1203 **1938.**
17. Wieland, H., A. Hartman, and H. Dietrich, Ann. **522,** 191 **1936.**
18. Winterstein, A., K. Schön, and H. Vetter, Z. physiol. Chem. **230,** 158 **1934.**

2. DIBENZOANTHRACENES, DIBENZOPHENANTHRENES, AND THEIR ALKYL DERIVATIVES, C_nH_{2n-30}

$C_{22}H_{14}$

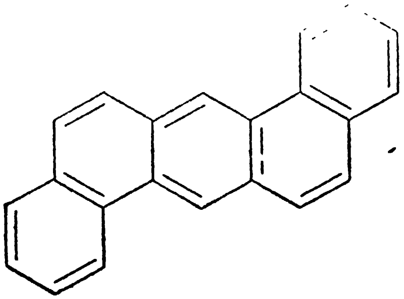
1,2,3,4-Dibenzoanthracene



M. P., °C

205[7]
203–204[16]
200–202[2]
200–201.5[4]

1,2,5,6-Dibenzoanthracene



M. P., °C

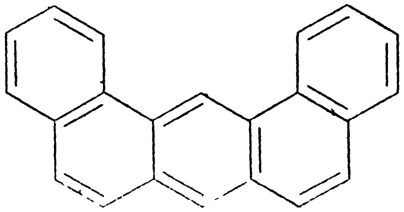
264.5
266.6–266.9[17]
266–266.5[20]
265.5–266.0[26]
263.5–264.5[25]
262.7–264.0[17]
262[6, 29]
261–262[22]
261–261.5[16, 18]
260[24]

D_4^{20}

1.282 (a)[24]

(a) The temperature of this determination was not given.

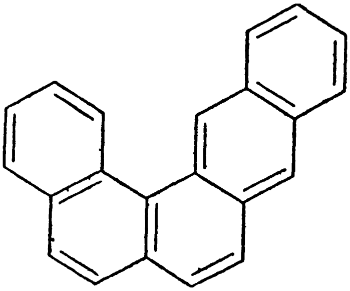
1,2,7,8-Dibenzoanthracene



M. P., °C

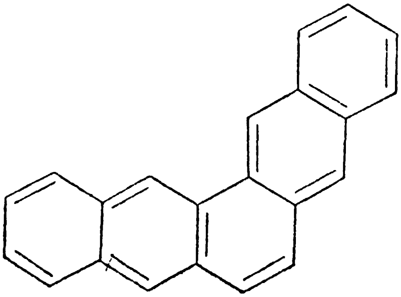
198.0–198.4[17]
196[14]
195–196[27]

2,3,5,6-Dibenzophenanthrene



M. P., °C
261[11]
137–138[23]

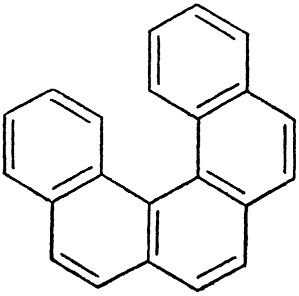
2,3,6,7-Dibenzophenanthrene



M. P., °C
257[8]
255–257[30]
250–251[10]

Additional Data
Sublimation Temp. (°C)
230 12mm[10]

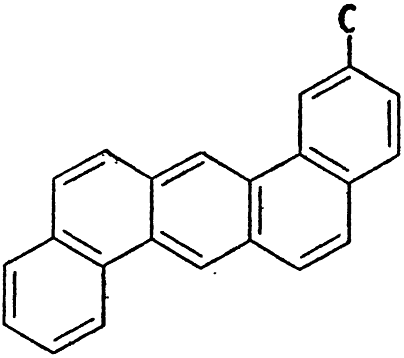
3,4,5,6-Dibenzophenanthrene



M. P., °C
177–178[15]
177[28]
145–146[29]

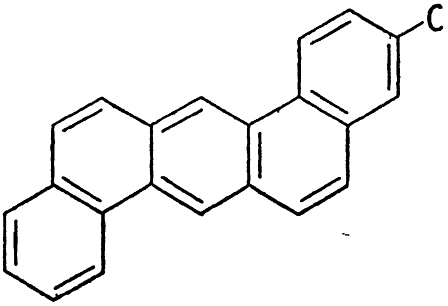
$C_{23}H_{16}$

1,2-(4′-Methylbenzo)-5,6-benzoanthracene



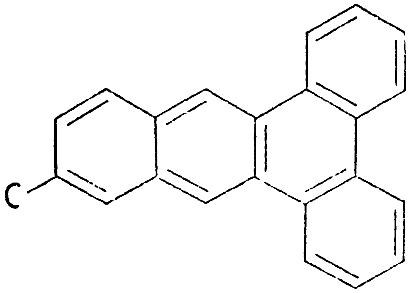
M. P., °C
256–257.5[12, 13]

1,2-(5′-Methylbenzo)-5,6-benzoanthracene



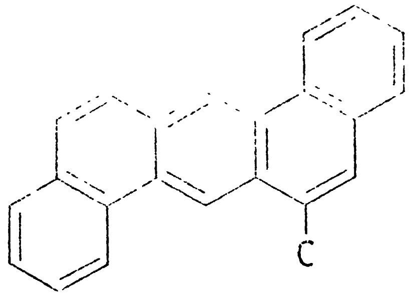
M. P., °C
245[12, 13, 16]
244–245[19]

1,2,3,4-Dibenzo-6-methylanthracene



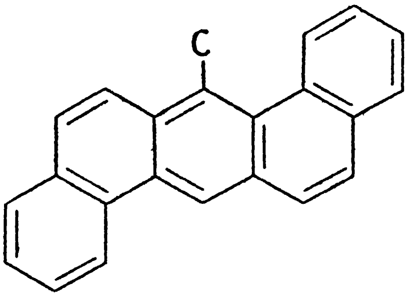
M. P., °C
157.5–158[4]

1,2,5,6-Dibenzo-4-methylanthracene



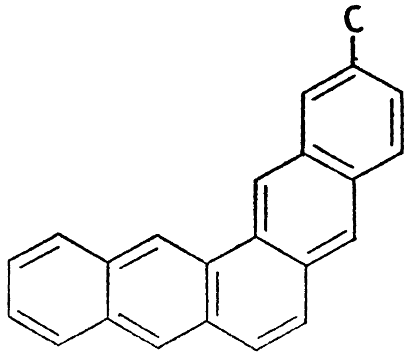
M. P., °C
184–185[16]

1,2,5,6-Dibenzo-9-methylanthracene



M. P., °C
192–194.5[21]

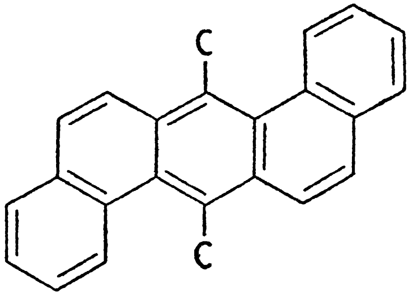
2,3-(4′-Methylbenzo)-6,7-benzophenanthrene



M. P., °C
315–316[9]

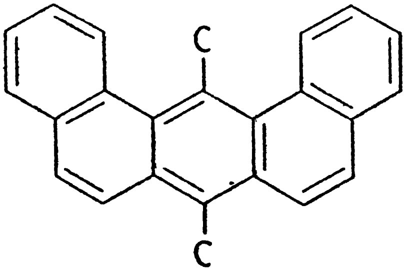
$C_{24}H_{18}$

1,2,5,6-Dibenzo-9,10-dimethylanthracene



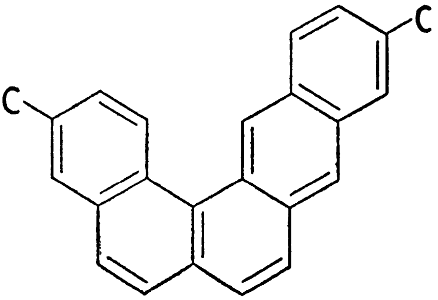
M. P., °C
205.5–206.5[3,13]
203–204[1]

1,2,7,8-Dibenzo-9,10-dimethylanthracene



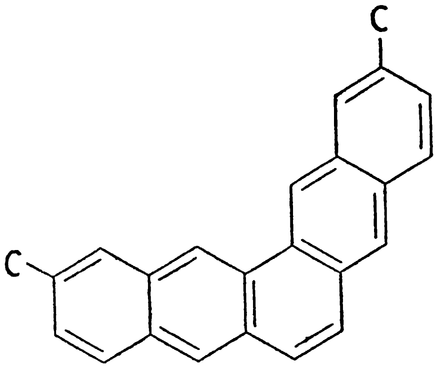
M. P., °C
205.5–206.5[12]

2,3-(5′-Methylbenzo)-5,6-(4′-methylbenzo)-phenanthrene



M. P., °C
228[11]

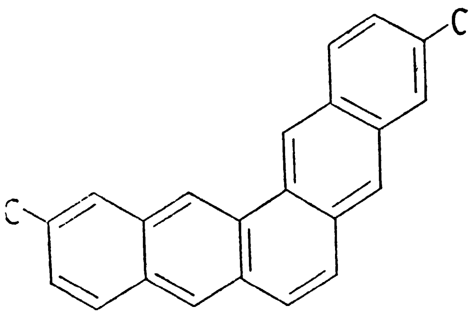
2,3-(4′-Methylbenzo)-6,7-(5′-methylbenzo)-phenanthrene (a)



M. P., °C
325[5]

(a) More information about this compound is found in references 8 and 10. The physical constants in these references were found to be in error.

2,3,6,7-Di-(5′-methylbenzo)-phenanthrene (a)

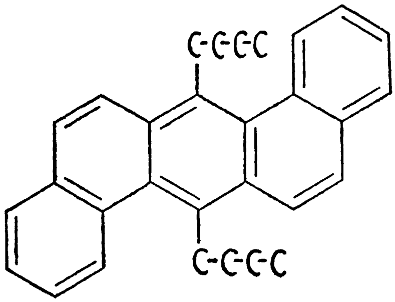


M. P., °C
325[5]

(a) More information about this compound is found in references 8 and 10. The physical constants in these references were found to be in error.

$C_{30}H_{30}$

1,2,5,6-Dibenzo-9,10-di-*n*-butylanthracene



M. P., °C
143.5–144.5[12,13]

References on Dibenzoanthracenes, Dibenzophenanthrenes, and Their Alkyl Derivatives

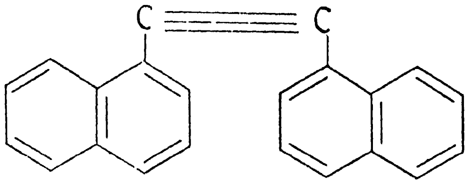
1. Akin, R. B., and M. T. Bogert, J. Am. Chem. Soc. **59,** 1564 **1937.**
2. Bachmann, W. E., J. Am. Chem. Soc. **56,** 1363 **1934.**
3. Bachmann, W. E., and J. M. Chemerda, J. Am. Chem. Soc. **61,** 2358 **1939.**
4. Bachmann, W. E., and L. H. Pence, J. Am. Chem. Soc. **59,** 2339 **1937.**

5. Clar, E., "Aromatische Kohlenwasserstoffe," Springer-Verlag, Berlin, **1941.**
6. Clar, E., Ber. **62,** 350 **1929.**
7. Clar, E., through Cook, Hieger, Kennaway, and Mayneord, Proc. Roy. Soc. London **111B,** 455 **1932.**
8. Clar, E., and F. John, Ber. **64,** 981 **1931.**
9. Clar, E., F. John, and R. Avenarius, Ber. **72,** 2139 **1939.**
10. Clar, E., F. John, and B. Hawran, Ber. **62,** 940 **1929.**
11. Clar, E., and H. D. Wallenstein, Ber. **64,** 2076 **1931.**
12. Cook, J. W., J. Chem. Soc. **1931,** 487.
13. Cook, J. W., J. Chem. Soc. **1931,** 489.
14. Cook, J. W., J. Chem. Soc. **1932,** 1472.
15. Cook, J. W., J. Chem. Soc. **1933,** 1592.
16. Cook, J. W., I. Hieger, E. L. Kennaway, and W. V. Mayneord, Proc. Roy. Soc. London **111B,** 455 **1932.**
17. Davis, W. W., M. E. Krahl, and G. H. A. Clowes, J. Am. Chem. Soc. **62,** 3080 **1940.**
18. Earle, W. R., and C. Voegtlin, Am. J. Cancer **34,** 373 **1938.**
19. Fieser, L. F., and E. M. Dietz, Ber. **62,** 1827 **1929.**
20. Fieser, L. F., and E. B. Hershberg, J. Am. Chem. Soc. **60,** 1893 **1938.**
21. Fieser, L. F., and G. W. Kilmer, J. Am. Chem. Soc. **61,** 862 **1939.**
22. Fieser, L. F., and M. S. Newman, J. Am. Chem. Soc. **58,** 2376 **1936.**
23. Hewett, C. L., J. Chem. Soc. **1938,** 1286.
24. Krishnan, K. S., and S. Banerjee, Z. Krist. **91,** 170 **1935;** C A. **29,** 7731 **1935;** Chem. Zentr. **1935,** II, 2800.
25. Lorenz, E., and M. J. Shear, Am. J. Cancer **26,** 333 **1936.**
26. Shear, M. J., Am. J. Cancer **26,** 322 **1936.**
27. Waldmann, H., J. prakt. Chem. [2] **135,** 1 **1932.**
28. Weidlich, H. A , Ber. **71,** 1203 **1938.**
29. Weitzenbock, R., and A. Klinger, Sitzber. Akad. Wiss. Wien, Math naturw. Klasse **127,** Abt. IIb, 119 **1918.**
30. Winterstein, A., and K. Schon, Z. physiol. Chem. **230,** 116 **1934.**

3. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-30}

$C_{22}H_{14}$

Di-(1′-naphthyl)-ethyne



M. P., °C
225[25]
171[33, 34]

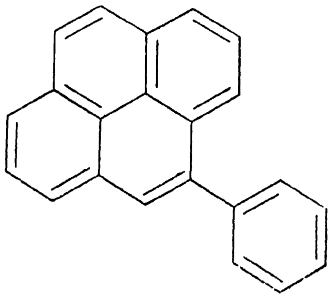
---

x-Phenylbenzo-[jk]-fluorene (a)

M. P., °C
144[48]

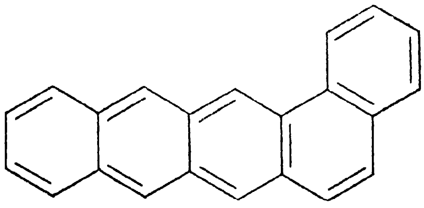
(a) The structure of this compound was not clearly defined in the literature.

4-Phenylpyrene



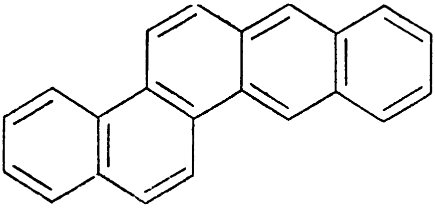
M. P., °C
169[47]

1,2-Benzonaphthacene



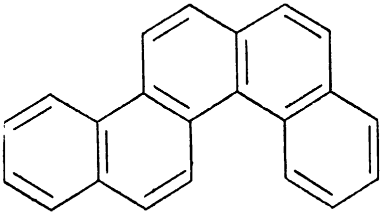
M. P., °C
263–264[3,12,15,16]

2,3-Benzochrysene



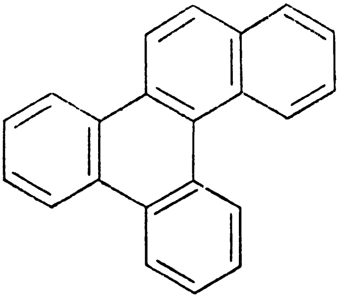
M. P., °C
293–294[12,16]
293[14]

3,4-Benzochrysene



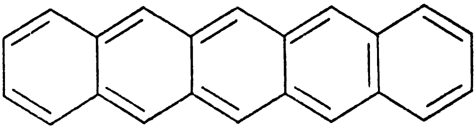
M. P., °C
128[4,50]
126–127[28]
122[49]

5,6-Benzochrysene



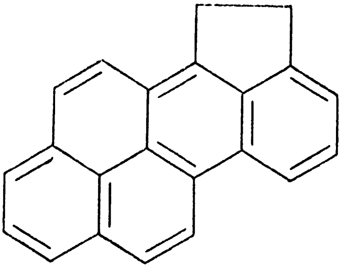
M. P., °C
115–116[9]
114.5–115[26,27]

Pentacene



M. P., °C
270–271[38,39]

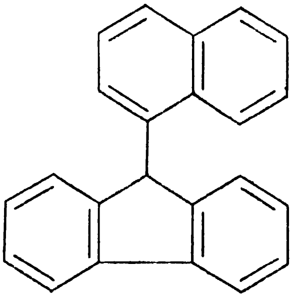
Benzo-[hij]-cholanthrene



M. P., °C
255–256[2]
252–253[36,37]

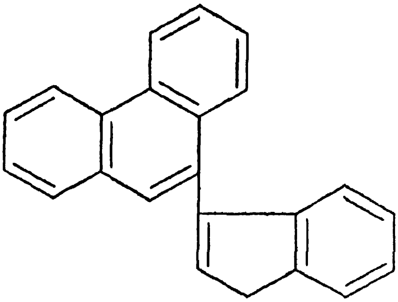
$C_{23}H_{16}$

9-(1′-Naphthyl)-fluorene



M. P., °C
113[31]
109–110[46]
103.5[45]

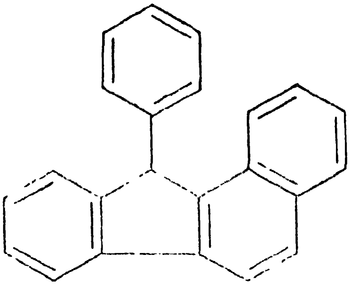
9-(3′-Indenyl)-phenanthrene



M. P., °C
121.5[5]

B. P., °C @ 760mm
230 0.7[5]

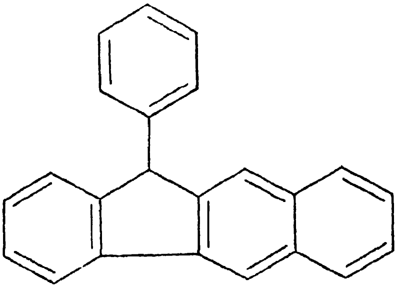
1,2-Benzo-9-phenylfluorene



M. P., °C
196[13, 31]
195.5[44]
195[6]
194[17]

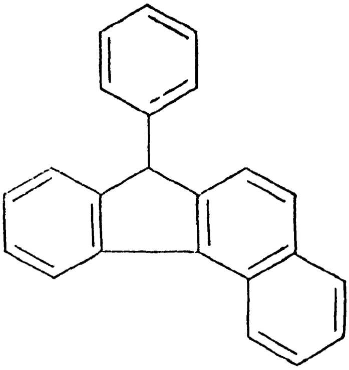
D_4^{20}
1.242 0° [53]

2,3-Benzo-9-phenylfluorene



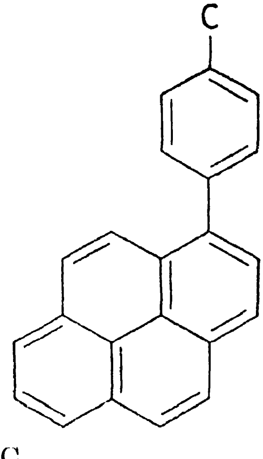
M. P., °C 137[24, 44]

3,4-Benzo-9-phenylfluorene



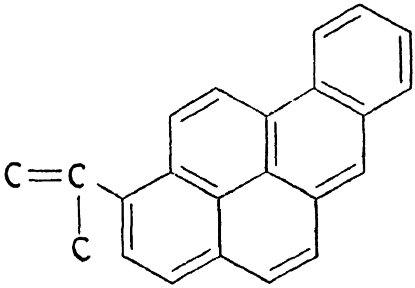
M. P., °C
135–138[13]

1-*p*-Tolylpyrene



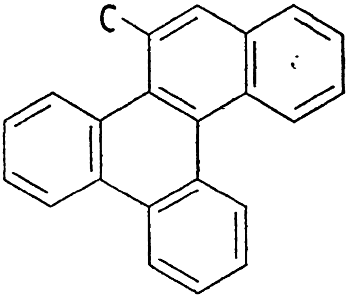
M. P., °C
155–156[41]

1,2-Benzo-8-isopropenylpyrene



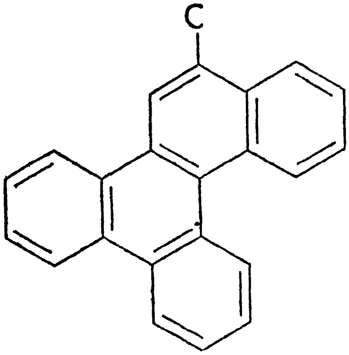
M.P., °C
114–115[51]

5,6-Benzo-11-methylchrysene



M.P., °C
163.5–164[10]

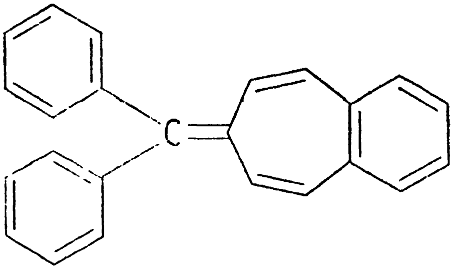
5,6-Benzo-12-methylchrysene



M.P., °C
150.5–151.5[10]

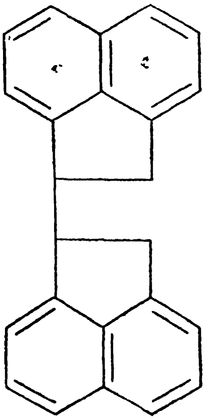
$C_{24}H_{18}$

1,2-Benzo-5-benzhydrylidenecyclo-heptadiene-3,6



M.P., °C
92[43]

1,1′-Biacenaphthenyl



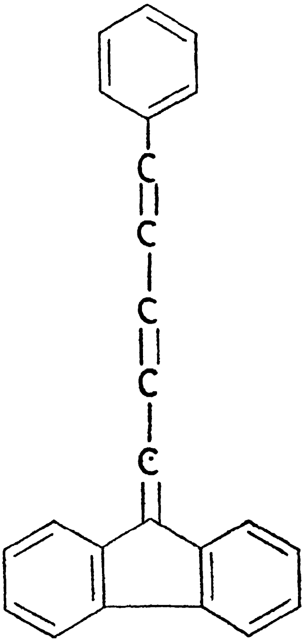
M.P., °C
120[18,19,21]

x,x′-Biacenaphthenyl (a)

M.P., °C
174[23]

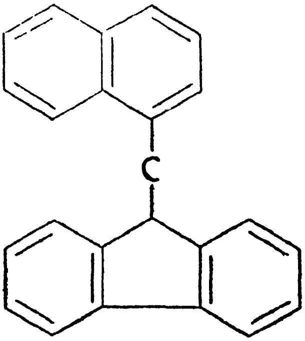
(a) The structure of this compound was not clearly defined in the literature.

1-Phenyl-5-(9′-fluorylidene)-pentadiene-1,3



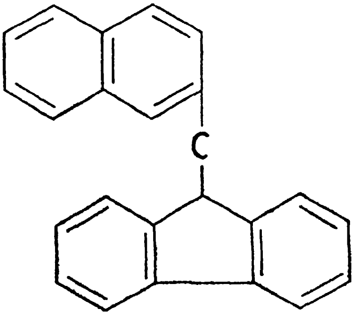
M. P., °C
155.5[32]

(1-Naphthyl)-(9′-fluoryl)-methane



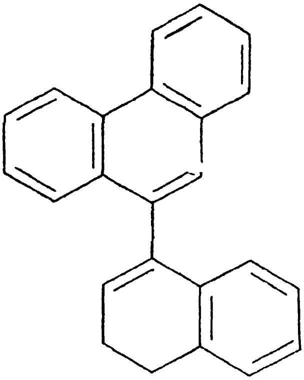
M. P., °C
135[40]
133–134[42]

(2-Naphthyl)-(9′-fluoryl)-methane



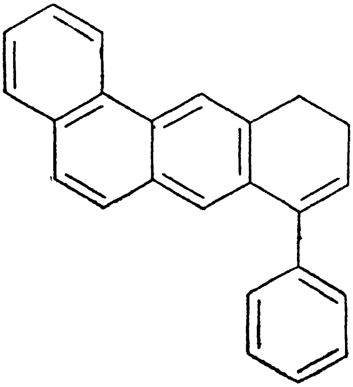
M. P., °C
164[42]

9-[4′-(1′,2′-Dihydronaphthyl)]-phenanthrene



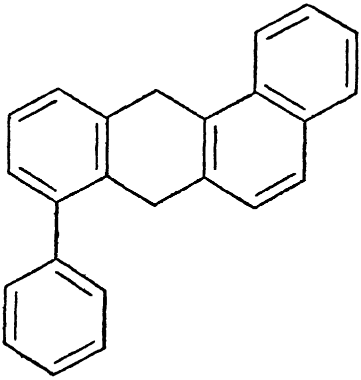
M. P., °C 181.5[5]

7,8-Benzo-5-phenyl-1,2-dihydroanthracene



M. P., °C
125–126[1]

1,2-Benzo-5-phenyl-9,10-dihydroanthracene

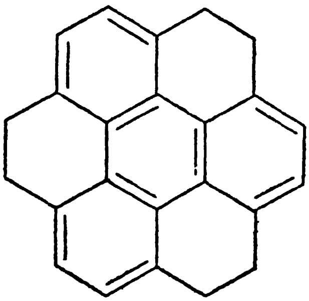


M. P., °C
96–96.5[3]

Crackene (a)
M. P., °C
309–310[7]
308[29, 30]

(a) The structure of this compound was not clearly defined in the literature. It may be a dimethyl picene or a dinaphthylbutene.

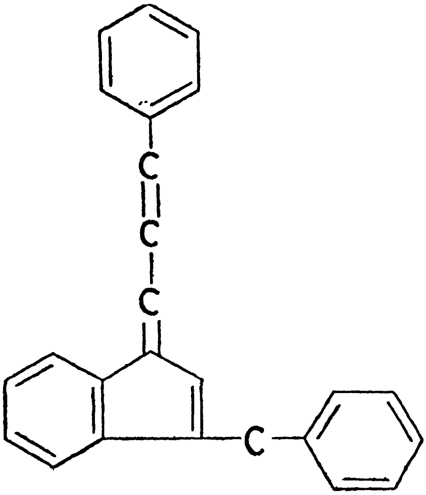
1,2,5,6,9,10-Hexahydrocoronene



M. P., °C
271–272[22]

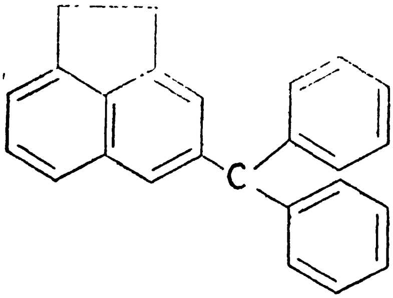
$C_{25}H_{20}$

1-Phenyl-3-(3′-benzylindenylidene)-propene-1



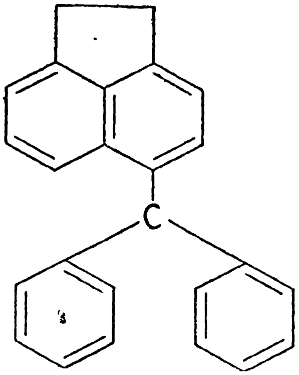
M. P., °C
161–162[52]

4-Benzhydrylacenaphthene



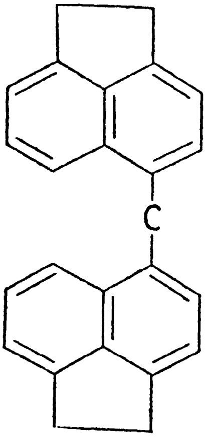
M. P., °C
176[35]

5-Benzhydrylacenaphthene



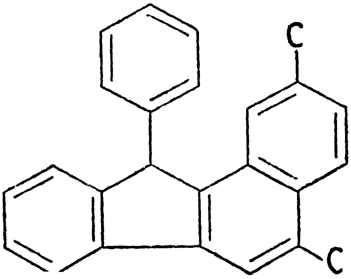
M. P., °C
167[8]

Di-5,5′-acenaphthylmethane



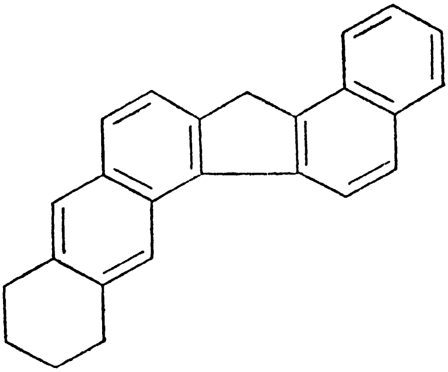
M. P., °C
140–141[20]

1,2-(4′-Methylbenzo)-3-methyl-9-phenylfluorene



M. P., °C
215[17]

1,2-Benzo-5,6-[3′,2′-(5′,6′,7′,8′-tetrahydronaphtho)]-fluorene



M. P., °C
160[11]

B. P., °C @ 760mm
330 2[11]

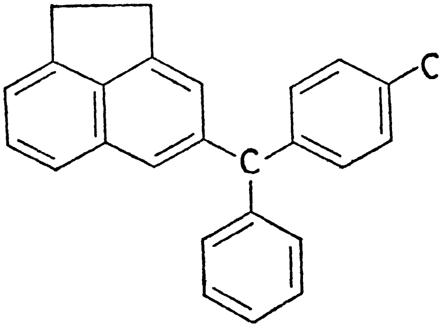
$C_{26}H_{22}$

x-Benzhydrylidene-x,x-dimethyl-x,x-benzocycloheptadiene-x,x (a)

M. P., °C
128.5–129[43]

(a) The structure of this compound was not clearly defined in the literature.

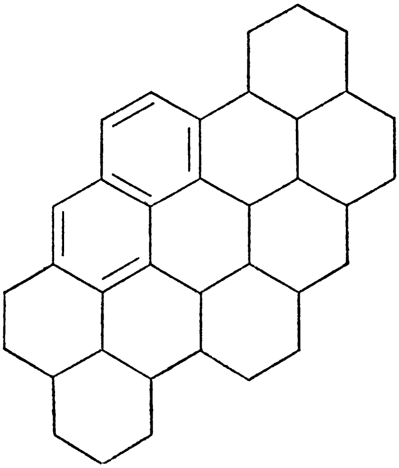
Phenyl-*p*-tolyl-(4-acenaphthyl)-methane



M. P., °C
209[35]

$C_{36}H_{42}$

Didecahydronaphtho-[3′,4′,5′-abc, 3″,4″,5″-jkl]-1,2,2a,3,4,4a, 5,6,6a,7,8,12c,12d,12e-tetradecahydrocoronene



M. P., °C
262–263[22]

References on Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-30}

1. Bachmann, W. E., and J. T. Bradbury, J. Org. Chem. **2,** 175 **1937–38.**
2. Bachmann, W. E., and M. Carmack, J. Am. Chem. Soc. **63,** 1685 **1941.**
3. Bachmann, W. E., and L. H. Pence, J. Am. Chem. Soc. **59,** 2339 **1937.**
4. Bergmann, E., J. Chem. Soc. **1938,** 1291.
5. Bergmann, E., and F. Bergmann, J. Am. Chem. Soc. **59,** 1443 **1937.**
6. Bergmann, E., and H. A. Wolff, Ber. **63,** 1176 **1930.**
7. Börnstein, E., Ber. **39,** 1238 **1906.**
8. Bowden, S. T., and W. E. Harris, J. Chem. Soc. **1939,** 307.
9. Bradsher, C. K., and L. Rapoport, J. Am. Chem. Soc. **65,** 1646 **1943.**
10. Bradsher, C. K., and L. Rapoport, J. Am. Chem. Soc. **66,** 1281 **1944.**
11. Buu-Hoï and P. Cagniant, Rev. sci. **80,** 384 **1942;** C.A. **39,** 3277 **1945.**
12. Clar, E., Ber. **62,** 1574 **1929.**
13. Clar, E., Ber. **63,** 512 **1930.**
14. Clar, E., and L. Lombardi, Ber. **65,** 1411 **1932.**
15. Cook, J. W., J. Chem. Soc. **1931,** 499.
16. Cook, J. W., I. Hieger, E. L. Kennaway, and W. V. Mayneord, Proc. Roy. Soc. (London) **111B,** 455 **1932.**
17. Dilthey, W., J. prakt. Chem. [2] **109,** 273 **1925.**
18. Doliński, J., and K. Dziewoński, Ber. **48,** 1917 **1915.**
19. Doliński, J., and K. Dziewoński, Bull. intern. acad. sci. Cracovie **1914A,** 389.
20. Dziewoński, K., W. Kahl, W. Koczorswska, and A. Wulffsohn, Roczniki Chem. **13,** 154 **1933;** C.A. **27,** 3709 **1933;** Chem. Zentr. **1933,** I, 3566.
21. Dziewoński, K., and C. Paschalski, Ber. **47,** 2680 **1914.**
22. Fromherz, H., L. Thaler, and G. Wolf, Z. Elektrochem. **49,** 387 **1943.**
23. Garvey, B. S., Jr., L. F. Halley, and C. F. H. Allen, J. Am. Chem. Soc. **59,** 1827 **1937.**
24. Gomberg, M., and F. W. Sullivan, Jr., J. Am. Chem. Soc. **44,** 1810 **1922.**
25. Grabowski, J., Ber. **11,** 298 **1878.**
26. Hewett, C. L., Gazz. chim. ital. **67,** 728 **1937.**
27. Hewett, C., J. Chem. Soc. **1938,** 193.
28. Hewett, C. L., J. Chem. Soc. **1938,** 1286.
29. Klaudy, J., and I. Fink, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **108,** Abt. IIb, 788 **1899.**
30. Klaudy, J., and J. Fink, Chem. Ztg. **24,** 60 **1900.**
31. Kovache, A., Ann. chim. [9] **10,** 184 **1918.**
32. Kuhn, R., and A. Winterstein, Helv. Chim. Acta **11,** 116 **1928.**
33. Leroy, J. A., Bull. soc. chim. [3] **7,** 644 **1892.**
34. Leroy, J. A., Compt. rend. **113,** 1056 **1891.**
35. Lorriman, F. R., J. Am. Chem. Soc. **47,** 211 **1925.**
36. Mikhaĭlov, B. M., and N. G. Chernova, J. Gen. Chem. (U. S. S. R.) **12,** 276 **1942;** C.A. **37,** 3083 **1943.**

37. Mikhaĭlov, B. M., and N. G. Chernova, J. Gen. Chem. (U. S. S. R.) **12,** 525 **1942;** Survey For. Petrol. Liter. Aug. 20, **1943.**
38. Philippi, E., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **123,** Abt. IIb, 21 **1914.**
39. Philippi, E., Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **138** suppl., Abt. IIb, 638 **1929.**
40. Schlenk, W., and E. Bergmann, Ann. **479,** 42 **1930.**
41. Scholl, R., K. Meyer, and J. Donat, Ber. **70,** 2180 **1937.**
42. Sieglitz, A., and H. Jassoy, Ber. **54,** 2133 **1921.**
43. Staudinger, H., and N. Kon, Ann. **384,** 38 **1911.**
44. Ullmann, F., and A. Murav'ev-Vinogradov, Ber. **38,** 2213 **1905.**
45. Ullman, F., and R. von Wurstemberger, Ber. **38,** 4105 **1905.**
46. Vansheidt, A., and B. Moldavskiĭ, Ber. **63,** 1362 **1930.**
47. Vollmann, H., H. Becker, M. Corell, and H. Streeck, Ann. **531,** 1 **1937.**
48. von Braun, J., and G. Manz, Ber. **70,** 1603 **1937.**
49. Weidlich, H. A., Ber. **71,** 1203 **1938.**
50. Weizmann, C., and E. Bergmann, Scripta Academica Hierosolymitana (Jerusalem), Sci. Report No. 1 **1938.**
51. Windaus, A., and K. Raichle, Ann. **537,** 157 **1939.**
52. Wislicenus, W., and W. Hentrich, Ann. **436,** 9 **1924.**
53. Ziegler, K., and F. Ditzel, Ann. **473,** 194 **1929.**

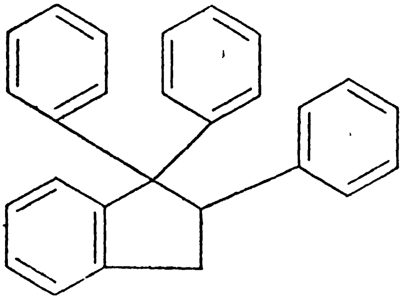
XIV. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-32}

1. Indane with Three Phenyl Substitutions
2. Fluorene with Two Phenyl Substitutions
3. Dihydroanthracenes and Dihydrophenanthrenes with Two Phenyl Substitutions
4. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-32}

1. INDANE WITH THREE PHENYL SUBSTITUTIONS, C_nH_{2n-32}

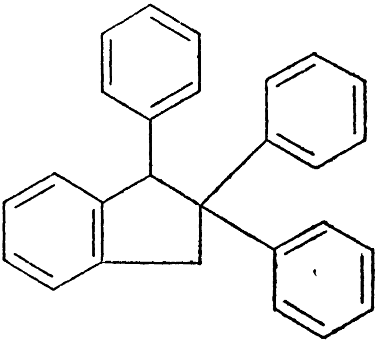
$C_{27}H_{22}$

1,1,2-Triphenylindane



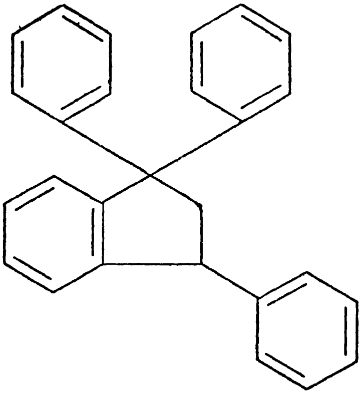
M. P., °C
83[7]

1,2,2-Triphenylindane



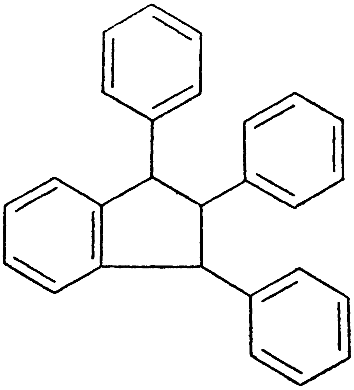
M. P., °C
140[7]

1,1,3-Triphenylindane



M. P., °C
112[2,7]
111–112[7]

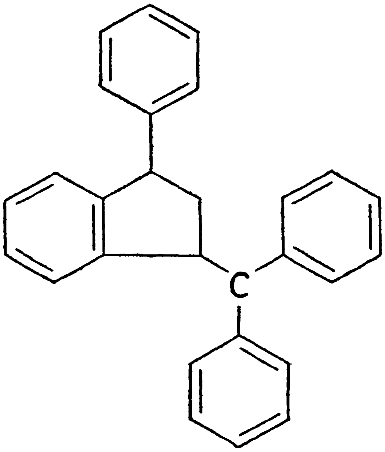
1,2,3-Triphenylindane



M. P., °C
154[6]
153[7]

$C_{28}H_{24}$

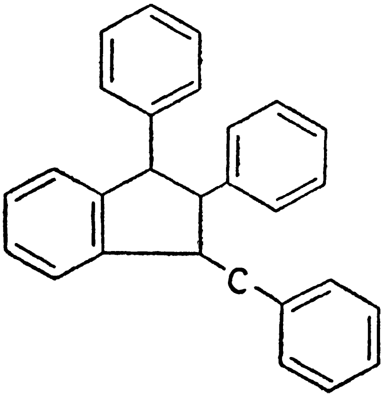
1-Phenyl-3-benzhydrylindane



M. P., °C
137[7]
135 (a)[10]
133–135[5]
133[9]
131[7]
107 (b)[10]

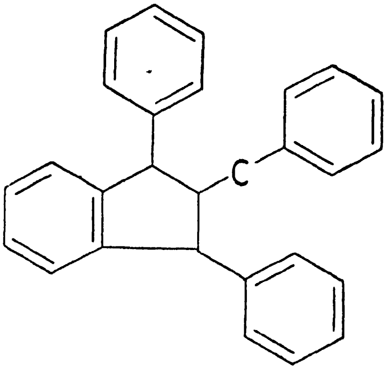
(a) This constant was determined on the stabile form of the compound.
(b) This constant was determined on the labile form of the compound.

1,2-Diphenyl-3-benzylindane



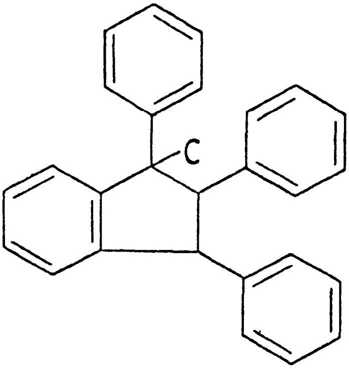
M. P., °C 115[1,4]

1,3-Diphenyl-2-benzylindane



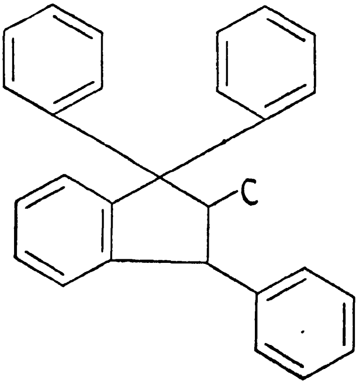
M. P., °C
121–122.5[4]

1-Methyl-1,2,3-triphenylindane



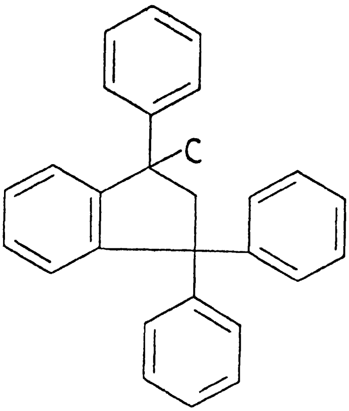
M. P., °C
163–165[3]
163–164[4]

1,1,3-Triphenyl-2-methylindane



M. P., °C
165[4]

1-Methyl-1,3,3-triphenylindane



M. P., °C
143[2,8]

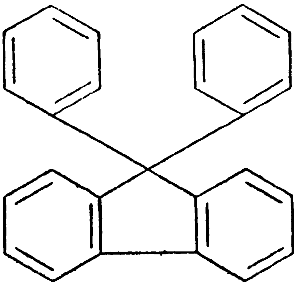
References on Indane with Three Phenyl Substitutions

1. Bergmann, E., and W. Schreiber, Ann. **500,** 118 **1933.**
2. Bergmann, E., and H. Weiss, Ann. **480,** 49 **1930.**
3. Bergmann, E., and H. Weiss, Ann. **480,** 59 **1930.**
4. Bergmann, E., and H. Weiss, Ann. **480,** 64 **1930.**
5. Blum-Bergmann, O., Ann. **484,** 26 **1930.**
6. Kohler, E. P., and W. E. Mydans, J. Am. Chem. Soc. **54,** 4667 **1932.**
7. Schlenk, W., and E. Bergmann, Ann. **463,** 1 **1928.**
8. Schoepfle, C. S., and J. D. Ryan, J. Am. Chem. Soc. **52,** 4021 **1930.**
9. Wieland, H., and H. Kloss, Ann. **470,** 201 **1929.**
10. Zal'kind, Y., and A. Kruglov, Ber. **61,** 2306 **1928.**

2. FLUORENE WITH TWO PHENYL SUBSTITUTIONS, C_nH_{2n-32}

$C_{25}H_{18}$

9,9-Diphenylfluorene



M. P., °C

222–223[16]

222[18]

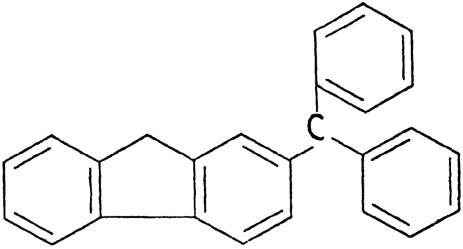
219–220[1]

D_4^{20}

1.220 0°[19]

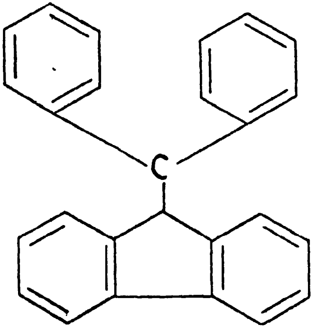
$C_{26}H_{20}$

2-Benzhydrylfluorene



M. P., °C
147–148[2]

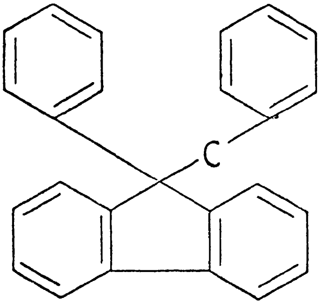
9-Benzhydrylfluorene



M. P., °C
217–218[7,20]
217[9,10,12]
216–217[3]
187–189 (a)[3]
187 (a)[12]

(a) This constant was determined on an isomeric form of the compound.

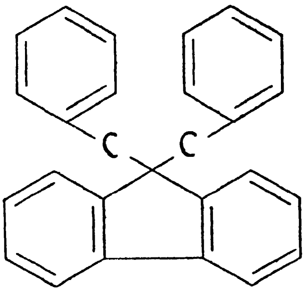
9-Phenyl-9-benzylfluorene



M. P., °C
139[11,14]
136–137[8]
136–136.5[15]
136[6]
125–126 (a)[14]

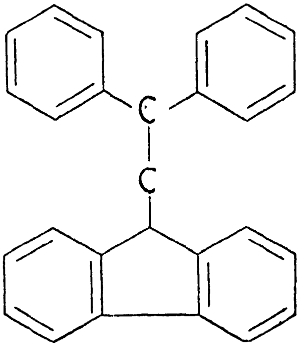
(a) This constant was determined on an isomeric form of the compound.

9,9-Dibenzylfluorene



M. P., °C
150–151[13]
147–148[17]

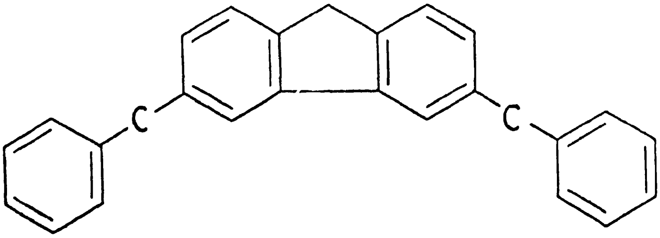
1,1-Diphenyl-2-(9′-fluoryl)-ethane



M. P., °C
107[12]

$C_{27}H_{22}$

3,6-Dibenzylfluorene



M. P., °C
125[4,5]

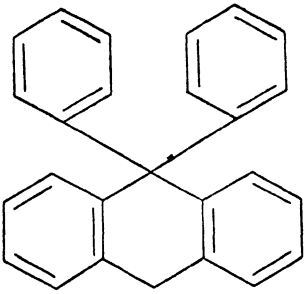
References on Fluorene with Two Phenyl Substitutions

1. Bachmann, W. E., J. Am. Chem. Soc. **52,** 3287 **1930.**
2. Bachmann, W. E., R. Hoffman, and F. Whitehead, J. Org. Chem. **8,** 320 **1943.**
3. Bergmann, E., Ber. **63,** 1617 **1930.**
4. Dziewoński, K., M. Dominikowna, L. Galuszkowna, and W. Muz, Roczniki Chem. **13,** 283 **1933;** C.A. **27,** 4533 **1933;** Chem. Zentr. **1933,** II, 1524.
5. Dziewoński, K., and A. Obtulowicz, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1930A,** 399.
6. Gomberg, M., and L. H. Cone, Ber. **39,** 2957 **1906.**
7. Kaufmann, V., Ber. **29,** 73 **1896.**
8. Kliegl, A., Ber. **38,** 284 **1905.**
9. Kliegl, A., Ber **64,** 2120 **1931.**
10. Klinger, H., and C. Lonnes, Ber. **29,** 734 **1896.**
11. Klinger, H., and C. Lonnes, Ber. **29,** 2152 **1896.**
12. Schlenk, W., and E. Bergmann, Ann. **463,** 1 **1928.**
13. Schlenk, W., and E. Bergmann, Ann. **479,** 58 **1930.**
14. Schlenk, W., and E. Bergmann, Ber. **62,** 745 **1929.**
15. Schmidt, R. E., B. Stein, and C. Bamberger, Ber. **62,** 1890 **1929.**
16. Sergeev, P. G., J. Russ. Phys. Chem. Soc. **61,** 1421 **1929;** Chem. Zentr. **1930,** II, 391.
17. Thiele, J., and F. Henle, Ann. **347,** 290 **1906.**
18. Ullmann, F., and R. von Wurstemberger, Ber. **38,** 4105 **1905.**
19. Ziegler, K., and F. Ditzel, Ann. **473,** 194 **1929.**
20. Ziegler, K., and W. Schafer, Ann. **511,** 101 **1934.**

3. DIHYDROANTHRACENES AND DIHYDROPHENANTHRENES WITH TWO PHENYL SUBSTITUTIONS, C_nH_{2n-32}

$C_{26}H_{20}$

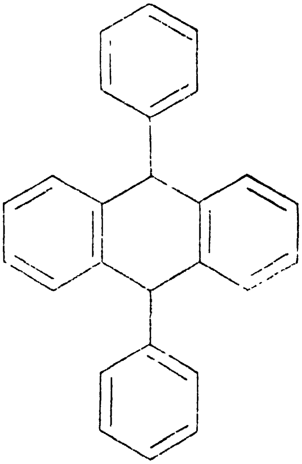
9,9-Diphenyl-9,10-dihydroanthracene



M. P. °C

200[1]
195–196[10]
194–195[2,4]

9,10-Diphenyl-9,10-dihydroanthracene



M. P., °C

227–228 (a)[7]
208[5]
198.5–199.5 (a)[7]
199 (b)[13]
190 (b)[13]

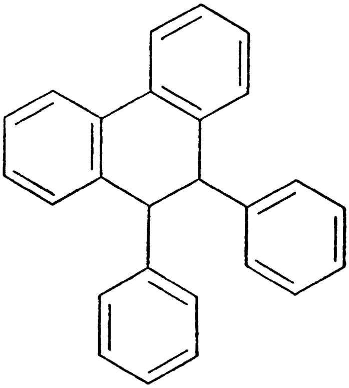
164.2[8, 11]
159[12]

B. P., °C @ 760mm
437[11]

(a) These constants were determined on isomeric forms.

(b) These constants were determined on different crystalline forms.

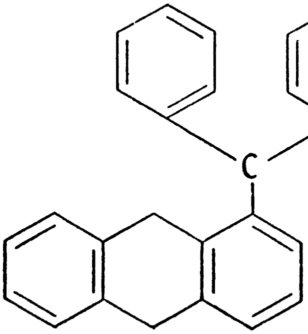
9,10-Diphenyl-9,10-dihydrophenanthrene



M. P., °C
130–131[13]

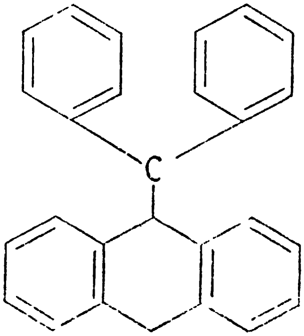
$C_{27}H_{22}$

1-Benzhydryl-9,10-dihydroanthracene



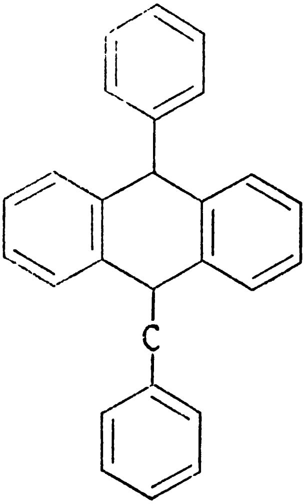
M. P., °C
131–132[14]

9-Benzhydryl-9,10-dihydroanthracene



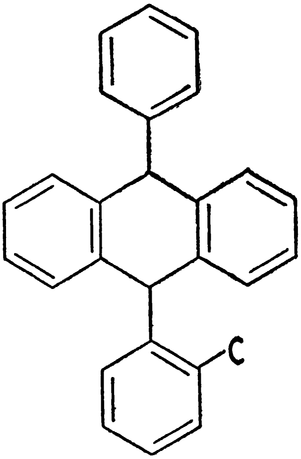
M. P., °C
207.5[13]

9-Phenyl-10-benzyl-9,10-dihydroanthracene



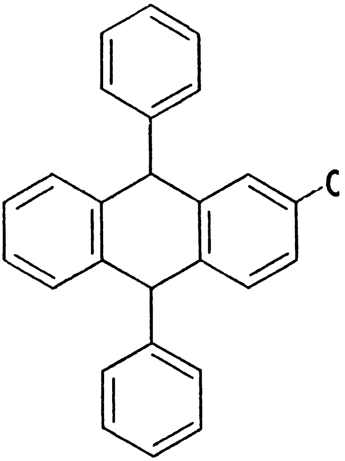
M. P., °C
119[13]

9-Phenyl-10-*o*-tolyl-9,10-dihydroanthracene



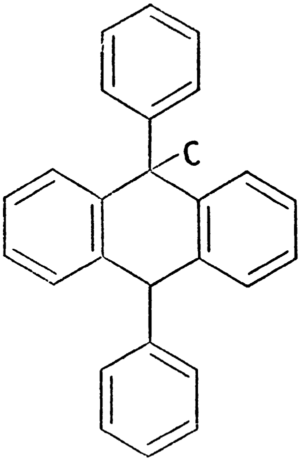
M. P., °C
186–187[7]

2-Methyl-9,10-diphenyl-9,10-dihydroanthracene



M. P., °C
179[6]

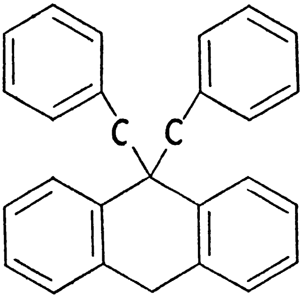
9-Methyl-9,10-diphenyl-9,10-dihydroanthracene



M. P., °C
171[13]

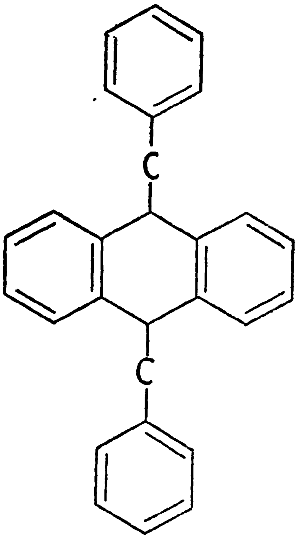
$C_{28}H_{24}$

9,9-Dibenzyl-9,10-dihydroanthracene



M. P., °C
178[3]
115[9]

9,10-Dibenzyl-9,10-dihydroanthracene



M. P., °C
118^3

---

x,x-Dimethyl-9,10-diphenyl-9,10-dihydroanthracene (a)

M. P., °C
185^{12}

(a) The structure of this compound was not clearly defined in the literature.

$C_{30}H_{28}$

x,x-Dimethyl-9,10-dibenzyl-9,10-dihydroanthracene (a)

M. P., °C
215^{12}

(a) The structure of this compound was not clearly defined in the literature.

References on Dihydroanthracenes and Dihydrophenanthrenes with Two Phenyl Substitutions

1. Barnett, E. de B., J. W. Cook, and I. G. Nixon, J. Chem. Soc. **1927**, 504.
2. Bergmann, E., Ber. **63**, 1617 **1930**.
3. Bergmann, E., and S. Fujise, Ann. **480**, 188 **1930**.
4. Blicke, F. F., and R. A. Patelski, J. Am. Chem. Soc. **58**, 559 **1936**.
5. Dufraisse, C., L. Velluz, and Mme. L. Velluz, Bull. soc. chim. [5] **5**, 1073 **1938**.
6. Guyot, A., and C. Staehling, Bull. soc. chim. [3] **33**, 1105 **1905**.
7. Haack, E., Ber. **62**, 1771 **1929**.
8. Haller, A., and A. Guyot, Bull soc chim. [3] **31**, 795 **1904**.
9. Hallgarten, F., Ber. **21**, 2508 **1888**.
10. Liebermann, C., and S. Lindenbaum, Ber. **38**, 1799 **1905**.
11. Linebarger, C. E., Am. Chem. J. **13**, 556 **1891**.
12. Rây, J. N., J. Chem. Soc. **117**, 1335 **1920**.
13. Schlenk, W., and E. Bergmann, Ann. **463**, 1 **1923**.
14. Scholl, R., and J. Donat, Ann. **512**, 1 **1934**.

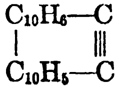
4. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-32}

$C_{22}H_{12}$

Dinaphthylanthrylene (a)

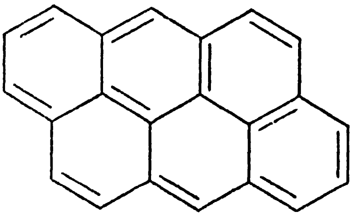
M. P., °C
270^{23}

(a) This name was given in the literature with the formula:



$$\begin{array}{l} C_{10}H_6\text{—}C \\ \;\;| \qquad\;\; ||| \\ C_{10}H_5\text{—}C \end{array}$$

Dibenzo-[cd,jk]-pyrene
(Anthranthrene)



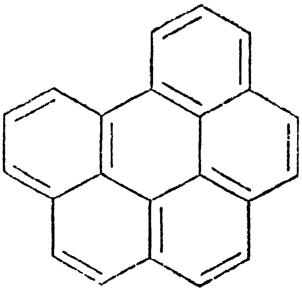
M. P., °C

261[8, 9]

258[14]

257[29]

Benzo-[ghi]-perylene



M. P., °C

278–281[12]

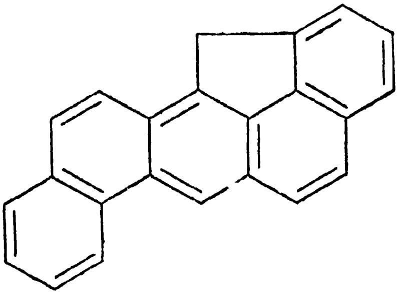
277–278.5[12]

273[5, 7]

272[35]

$C_{23}H_{14}$

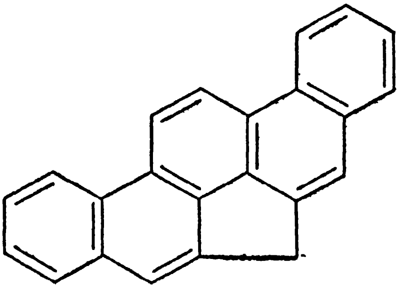
Benzo-[bc]-cholanthrene



M. P., °C

266–267[21]

Cyclopentano-[ghi]-picene

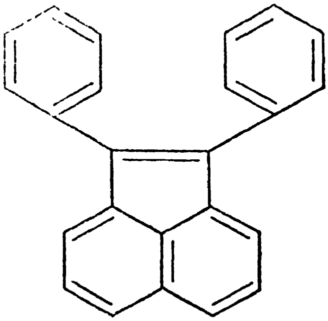


M. P., °C

277[31]

$C_{24}H_{16}$

1,2-Diphenylacenaphthylene



M. P., °C

164.5–166[24]

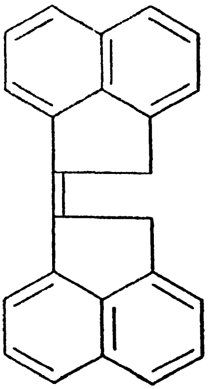
161–162[32]

161.3[2]

159.5–161[33]

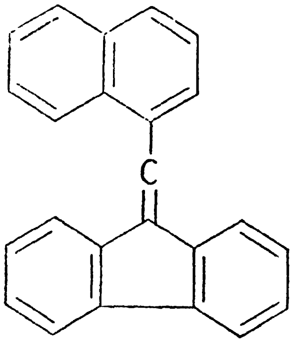
1,1′-Biacenaphthylidene

(Biacene)



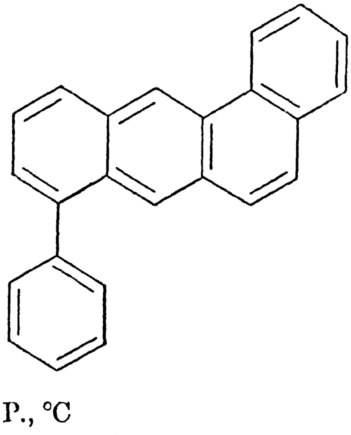
M. P., °C
277[15, 16]
275-276[17]
271-273[18]

(1-Naphthyl)-(9′-fluorylidene)-methane



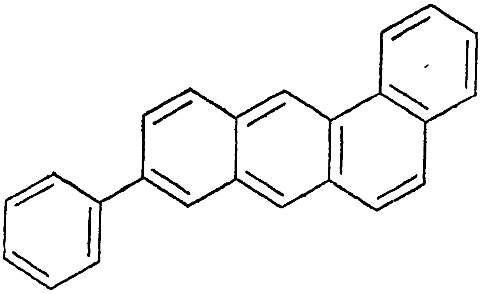
M. P., °C
149-150[28]

1,2-Benzo-5-phenylanthracene



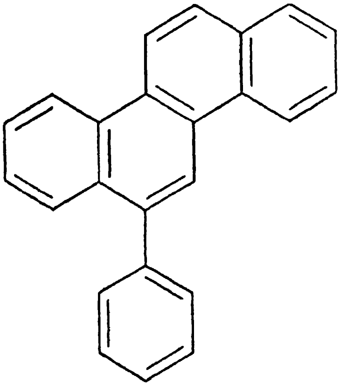
M. P., °C
151-152[1]

1,2-Benzo-6-phenylanthracene



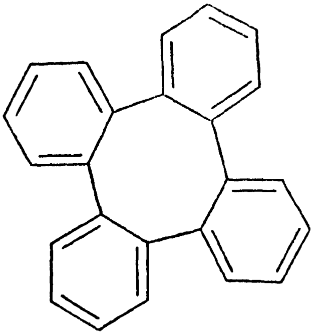
M. P., °C
240-241[10]

6-Phenylchrysene



M. P., °C
192-192.5[30]

1,2,3,4,5,6,7,8-Tetrabenzocyclo-octane
(Tetraphenylene)



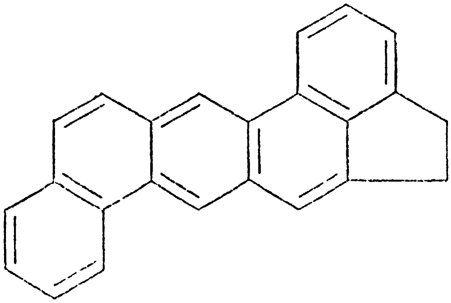
M. P., °C
233[26]

Tetraphenylene (a)

M. P., °C
304–305[6]

(a) The structure of this compound was not clearly defined in the literature.

Indo-[3,4-ab]-benzo-[h]-anthracene



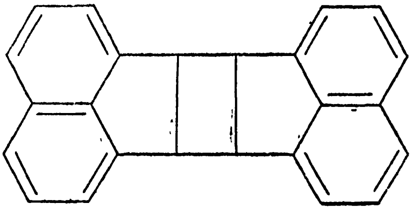
M. P., °C
231 233[11]

x,x-Dihydro-x,x-dibenzopyrene (a)

M. P., °C
313.5-314.5[31]

(a) The structure of this compound was not clearly defined in the literature.

1,2,3,4-Di-(2′,1′-acenaphtheno)-cyclobutane
(α-Heptacyclene)



M. P., °C
306–307[19, 20]

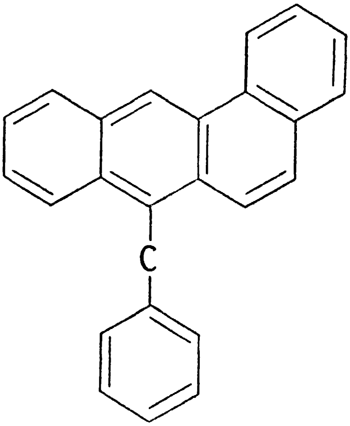
β-Heptacyclene (a)

M. P., °C
234[20]
232–234[19]

(a) The structure of this compound was not clearly defined in the literature.

$C_{25}H_{18}$

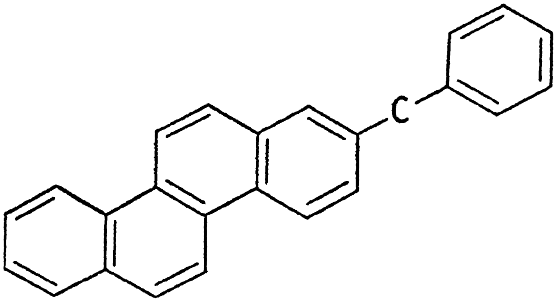
1,2-Benzo-10-benzylanthracene



M. P., °C
195–196[10]

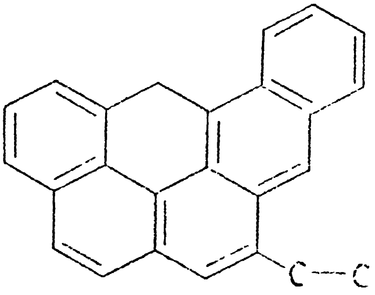
This series continued on next page

2-Benzylchrysene



M. P., °C
200[22]

Dibenzo-[a, jk]-4-ethyl-10-hydropyrene (a)

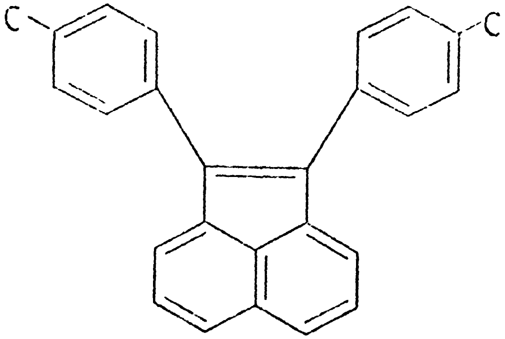


M. P., °C
116.5–117.5[13]

(a) The structure of this compound was not clearly defined in the literature.

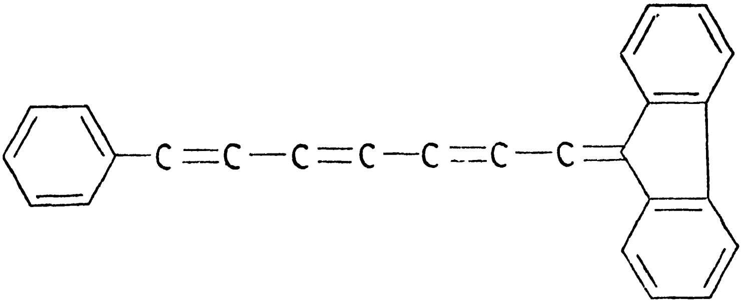
$C_{26}H_{20}$

1, 2-Di-*p*-tolylacenaphthylene



M. P., °C

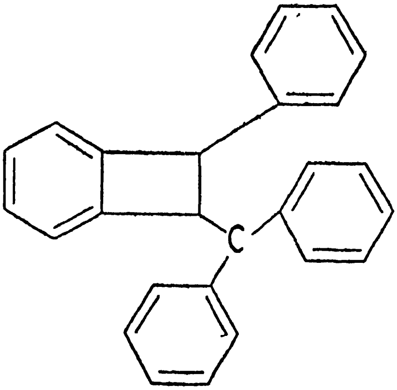
1-Phenyl-7-(9′-fluorylidene)-heptatriene-1,3,5



M. P., °C
166[25]

$C_{27}H_{22}$

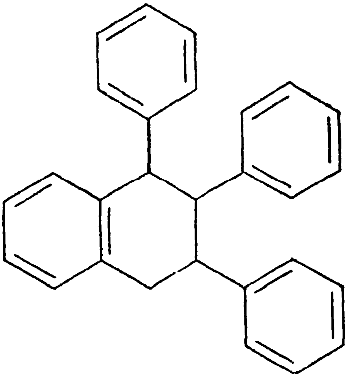
1-Phenyl-2-benzhydryl-3,4-benzocyclobutane



M. P., °C
184[27]

$C_{28}H_{24}$

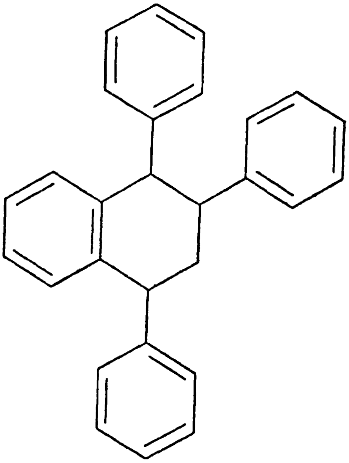
1,2,3-Triphenyl-1,2,3,4-tetrahydronaphthalene



M. P., °C
136–137[8]

This series continued on next page

1,2,4-Triphenyl-1,2,3,4-tetrahydronaphthalene



M. P., °C
127[4]

References on Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-32}

1. Bachmann, W. E., and J. T. Bradbury, J. Org. Chem. **2,** 175 **1937.**
2. Bachmann, W. E., and E. J.-H. Chu, J. Am. Chem. Soc. **58,** 1118 **1936.**
3. Bergmann, E., and O. Zwecker, Ann. **487,** 155 **1931.**
4. Blum, O., Ber. **62,** 881 **1929.**
5. Brass, K., and K. Fanta, Ber. **69,** 1 **1936.**
6. Chandra-Sircar, A., and J. N. Majumder, J. Indian Chem. Soc. **5,** 417 **1928.**
7. Clar, E., Ber. **65,** 846 **1932.**
8. Clar, E., Ber. **72,** 1645 **1939.**
9. Clar, E., Ber. **76,** 328 **1943.**
10. Cook, J. W., J. Chem. Soc. **1930,** 1087.
11. Cook, J. W., J. Chem. Soc. **1931,** 499.
12. Cook, J. W., and N. Percy, J. Soc. Chem. Ind. **64,** 27 **1945.**
13. Cook, J. W., and A. M. Robinson, J. Chem. Soc. **1940,** 303.
14. Corbellini, A., and F. Steffenoni, Rend. ist. lombardo sci. [2] **69,** 429 **1936;** Chem. Zentr. **1937,** I, 1420.
15. Doliński, J., and K. Dziewoński, Ber. **48,** 1917 **1915.**
16. Doliński, J., and K. Dziewoński, Bull. intern. acad. sci. Cracovie **1914 A,** 389.
17. Dziewoński, K., and L. Gizler, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1937 A,** 441.
18. Dziewoński, K., and T. Lityński, Ber. **58,** 2539 **1925.**
19. Dziewoński, K., and C. Paschalski, Ber. **46,** 1986 **1913.**
20. Dziewoński, K., and G. Rapalski, Ber. **45,** 2491 **1912.**
21. Fieser, L. F., and E. B. Seligman, J. Am. Chem. Soc. **57,** 1681 **1935.**
22. Funke, K., and E. Muller, J. prakt. Chem. [2] **144,** 242 **1936.**
23. Grabowski, J., Ber. **11,** 298 **1878.**
24. Koelsch, C. F., and H. J. Richter, J. Am. Chem. Soc. **59,** 2165 **1937.**
25. Kuhn, R., and A. Winterstein, Helv. Chim. Acta **11,** 116 **1928.**
26. Rapson, W. S., R. G. Shuttleworth, and J. N. van Niekerk, J. Chem. Soc. **1943,** 326.
27. Schlenk, W., and E. Bergmann, Ann. **463,** 1 **1928.**
28. Schlenk, W., and E. Bergmann, Ann. **479,** 42 **1930.**
29. Scholl, R., and K. Meyer, Ber. **67,** 1229 **1934.**
30. Simpson, J. C. E., J. Chem. Soc. **1943,** 447.
31. Waldmann, H., and G. Pitschak, Ann. **527,** 183 **1937.**
32. Wittig, G., and K. Henkel, Ann. **542,** 130 **1939.**
33. Wittig, G., M. Leo, and W. Wiemar, Ber. **64,** 2405 **1931.**
34. Zil'berman, G. B., J. Gen. Chem. (U. S. S. R.) **7,** 234 **1937;** C.A. **31,** 4314 **1937;** Chem. Zentr. **1937,** I, 4787.
35. Zinke, A., U. Noculak, R. Skrabal, and H. Troger, Ber. **73,** 1187 **1940.**

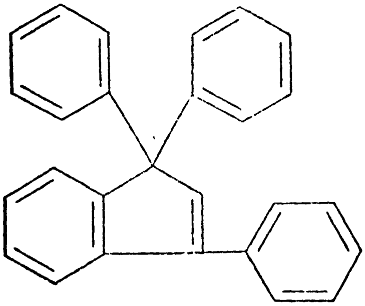
XV. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-34}

1. Indene with Three Phenyl Substitutions
2. Anthracene or Phenanthrene with Two Phenyl Substitutions
3. Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-34}

1. INDENE WITH THREE PHENYL SUBSTITUTIONS, C_nH_{2n-34}

$C_{27}H_{20}$

1,1,3-Triphenylindene



M. P., °C

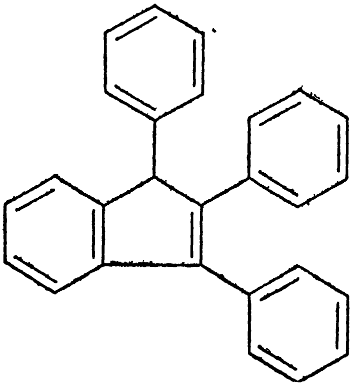
135[12,16]

134–135[15]

132–134[2,9]

133[17]

1,2,3-Triphenylindene



M. P., °C

135[12,18,17]

132–134[6]

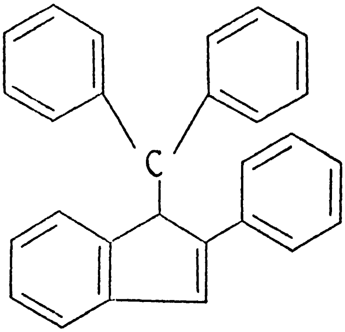
130–132[9]

D_4^{20}

1.176 0°[18]

$C_{28}H_{22}$

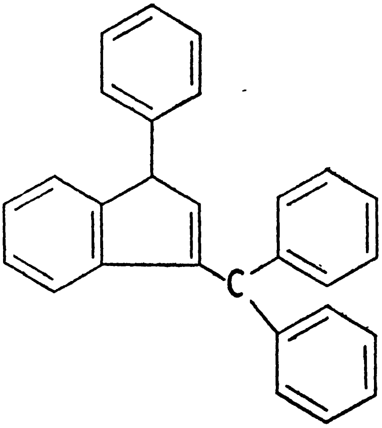
1-Benzhydryl-2-phenylindene



M. P., °C

175[4]

1-Phenyl-3-benzhydrylindene

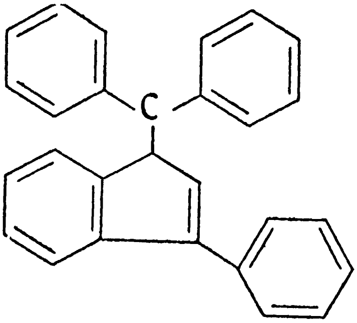


M. P., °C

131[15]

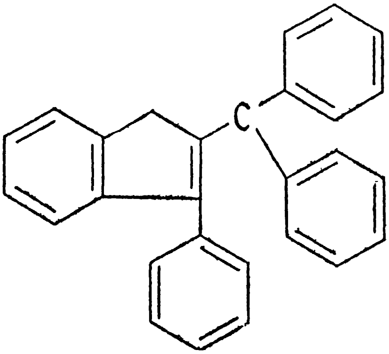
124–125[4]

1-Benzhydryl-3-phenylindene



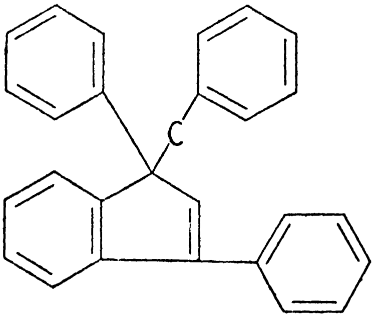
M. P., °C
174.5–175[4]
171[15]

2-Benzhydryl-3-phenylindene



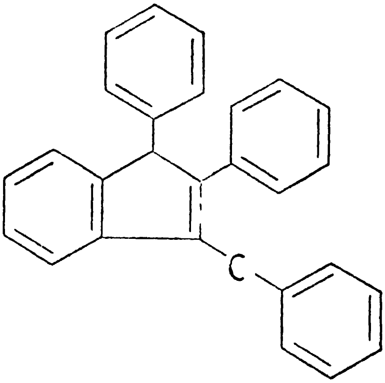
M. P., °C
162–163.5[10]

1-Benzyl-1,3-diphenylindene



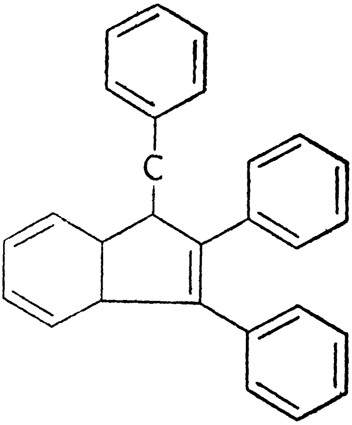
M. P., °C
100–102[8]

1,2-Diphenyl-3-benzylindene



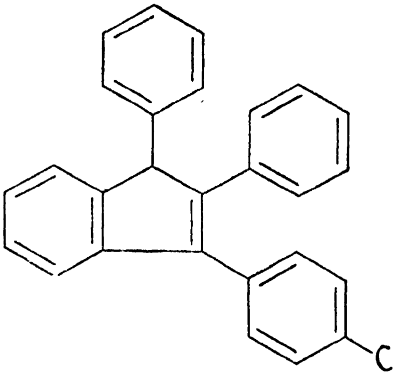
M. P., °C
143–144[1]
118.5–119.5[6]

1-Benzyl-2,3-diphenylindene



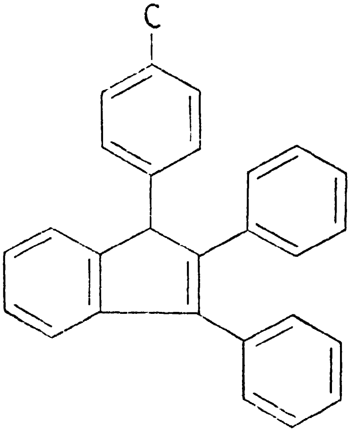
M. P., °C
118.5–120[6]

1,2-Diphenyl-3-*p*-tolylindene



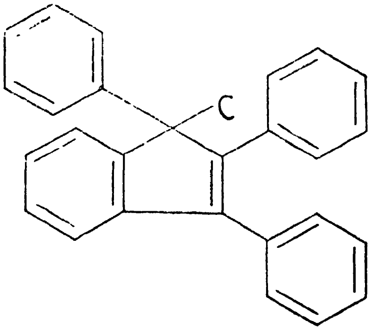
M. P., °C
116–117[7]

1-*p*-Tolyl-2,3-diphenylindene



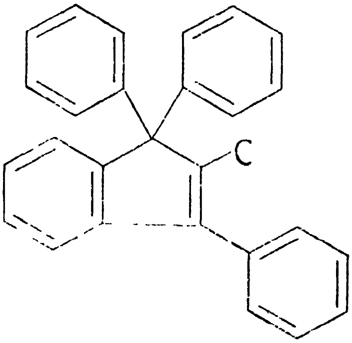
M. P., °C
154–156[7]

1-Methyl-1,2,3-triphenylindene



M. P., °C
96–98[11]

1,1,3-Triphenyl-2-methylindene



M. P., °C
157–159.5[11]
150[3]

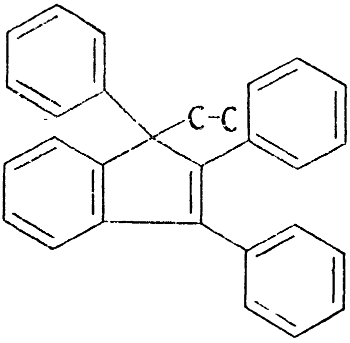
---

x-Methyl-x,x,x-triphenylindene (a)
M. P., °C
118[14]

(a) The structure of this compound was not clearly defined in the literature.

$C_{29}H_{24}$

1-Ethyl-1,2,3-triphenylindene



M. P., °C
108[12]

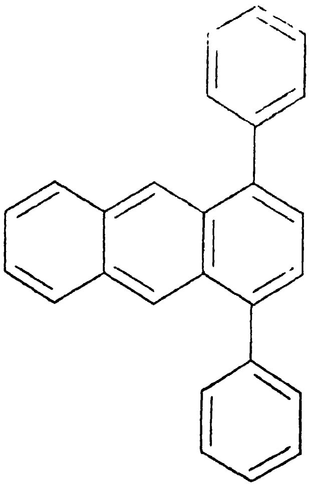
References on Indene with Three Phenyl Substitutions

1. Bergmann, E., and W. Schreiber, Ann. **500,** 118 **1933.**
2. Bergmann, E., and H. Weiss, Ann. **480,** 49 **1930.**
3. Bergmann, E., and H. Weiss, Ann. **480,** 61 **1930.**
4. Blum-Bergmann, O., Ann. **484,** 26 **1930.**
5. Blum-Bergmann, O., Ber. **65,** 109 **1932.**
6. Koelsch, C. F., J. Am. Chem. Soc. **54,** 2045 **1932.**
7. Koelsch, C. F., J. Am. Chem. Soc. **56,** 1337 **1934.**
8. Koelsch, C. F., J. Am. Chem. Soc. **56,** 1605 **1934.**
9. Koelsch, C. F., and P. R. Johnson, J. Am. Chem. Soc. **65,** 567 **1943.**
10. Koelsch, C. F., and R. V. White, J. Am. Chem. Soc. **65,** 1639 **1943.**
11. Koelsch, C. F., and R. V. White, J. Org. Chem. **6,** 602 **1941.**
12. Kohler, E. P., Am. Chem. J. **40,** 217 **1908.**
13. Kohler, E. P., and W. E. Mydans, J. Am. Chem. Soc. **54,** 4667 **1932.**
14. Kohler, E. P., and E. M. Nygaard, J. Am. Chem. Soc. **52,** 4128 **1930.**
15. Schlenk, W., and E. Bergmann, Ann. **463,** 1 **1928.**
16. Ziegler, K., Ann. **434,** 34 **1923.**
17. Ziegler, K., and F. Crossmann, Ber. **62,** 1768 **1929.**
18. Ziegler, K., and F. Ditzel, Ann. **473,** 194 **1929.**

2. ANTHRACENE OR PHENANTHRENE WITH TWO PHENYL SUBSTITUTIONS, C_nH_{2n-34}

$C_{26}H_{18}$

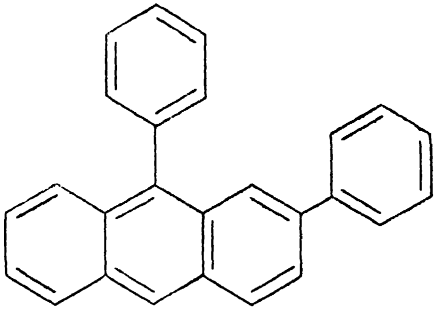
1,4-Diphenylanthracene



M. P., °C

170^{39}

2,9-Diphenylanthracene

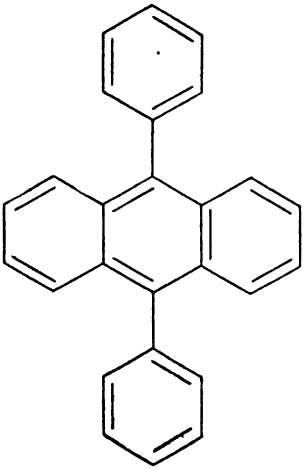


M. P., °C

$165–166^{25}$

This series continued on next page.

9,10-Diphenylanthracene

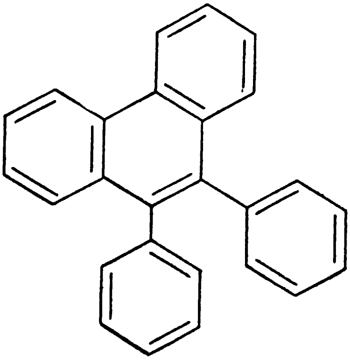


M. P., °C

247
250–251[19]
249–250[23, 26]
248[17]
247–248[16, 23]
247[25, 34]
246[38]
245–246[29]
242–243[28]
241–243[11]
214 (a)[34]

(a) This constant was determined on an isomeric form of the compound.

9,10-Diphenylphenanthrene

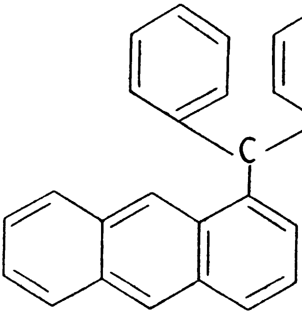


M. P., °C

236
240[35]
237[18, 30]
235–235.5[14]
235[36]
234[12, 15]
233–234[40]

$C_{27}H_{20}$

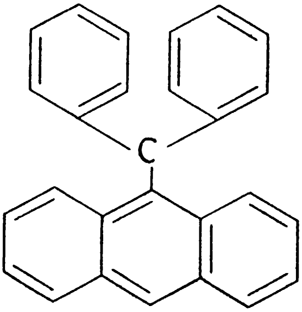
1-Benzhydrylanthracene



M. P., °C

173–175[37]

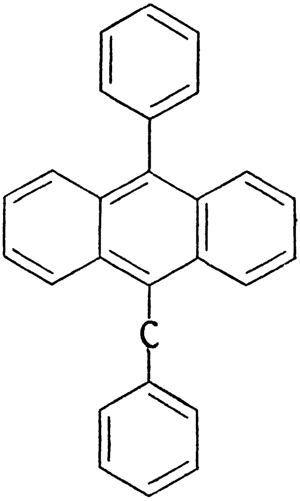
9-Benzhydrylanthracene



M. P., °C

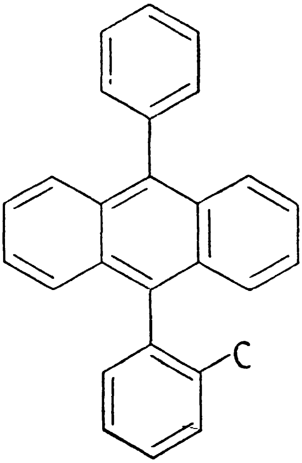
204–205[4]

9-Phenyl-10-benzylanthracene



M. P., °C
155[7]
154[27]
151[34]

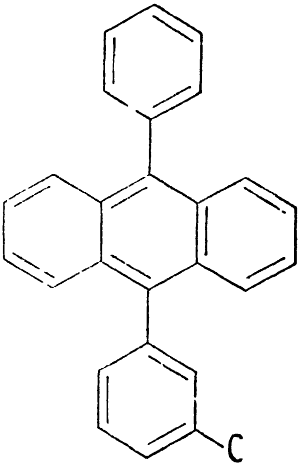
9-Phenyl-10-*o*-tolylanthracene



M. P., °C
261–262[23]
257–258[34]
172–173 (a)[34]

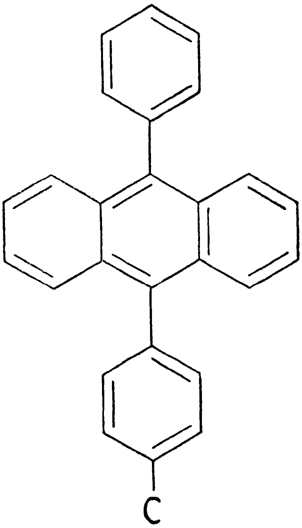
(a) This constant was determined on an isomeric form of the compound.

9-Phenyl-10-*m*-tolylanthracene



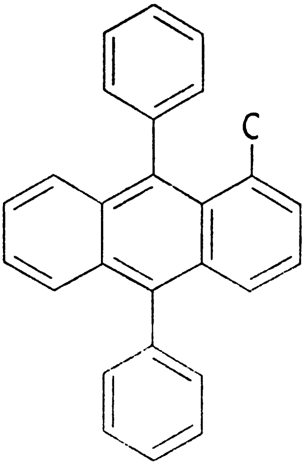
M. P., °C
182–183[34]

9-Phenyl-10-*p*-tolylanthracene



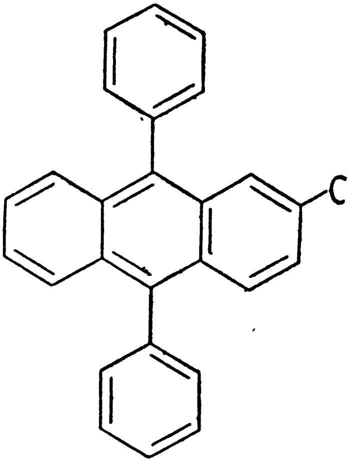
M. P., °C
192[22]

1-Methyl-9,10-diphenylanthracene



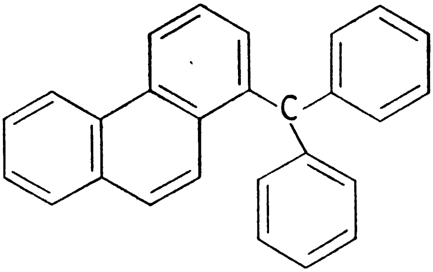
M. P., °C
194[34]

2-Methyl-9,10-diphenylanthracene



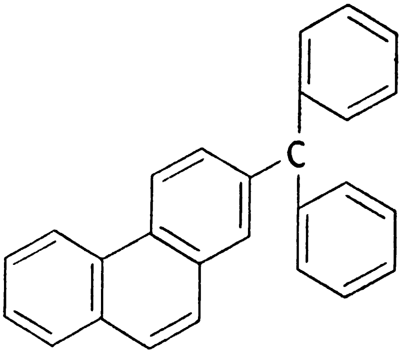
M. P., °C
242–243[20]
214[34]
213[21]

1-Benzhydrylphenanthrene



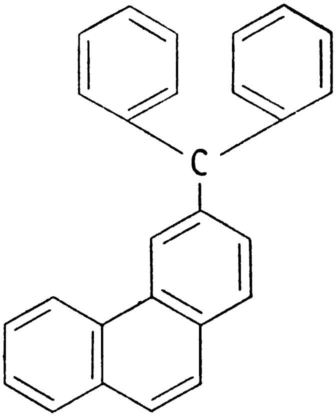
M. P., °C
175–176[3]

2-Benzhydrylphenanthrene



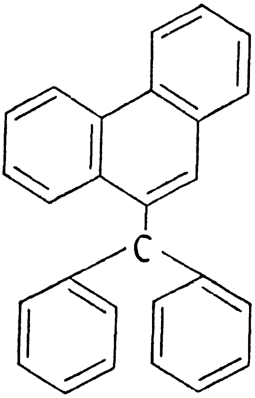
M. P., °C
151–152[3]

3-Benzhydrylphenanthrene



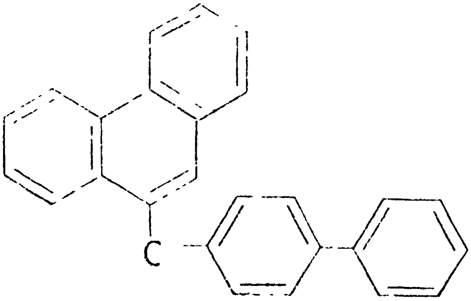
M. P., °C
122–123[3]

9-Benzhydrylphenanthrene



M. P., °C
175–176^{1}
174–175^{3}

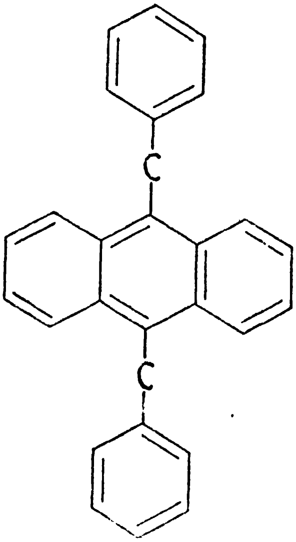
***p*-Biphenylyl-9-phenanthrylmethane**



M. P., °C
192–193^{3}

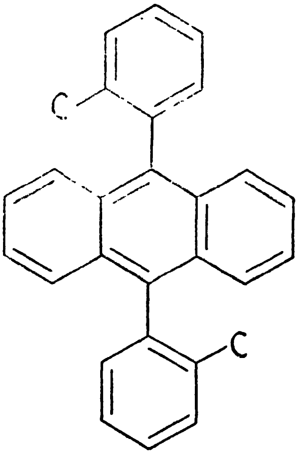
$C_{28}H_{22}$

9,10-Dibenzylanthracene



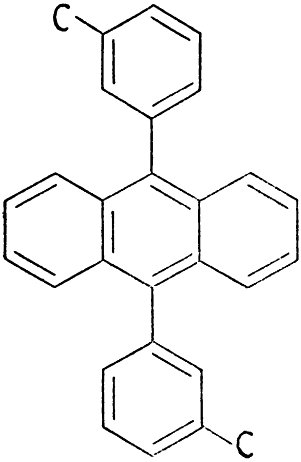
M. P., °C
242
245^{6}
243–245^{2}
241–242^{13}
241^{31}
240^{13}
239–240$^{41, 32}$

9,10-Di-*o*-tolylanthracene



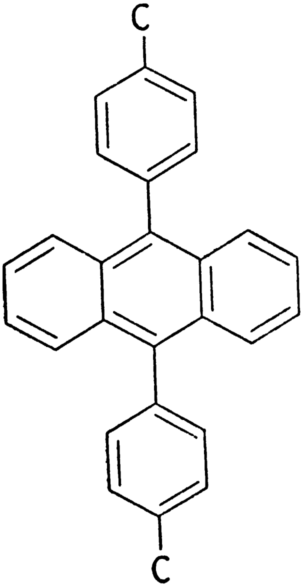
M. P., °C
347–348^{41}

9,10-Di-*m*-tolylanthracene



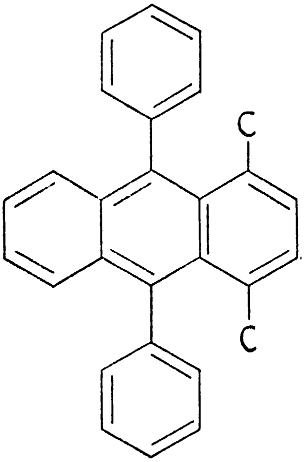
M. P., °C
222[41]

9,10-Di-*p*-tolylanthracene



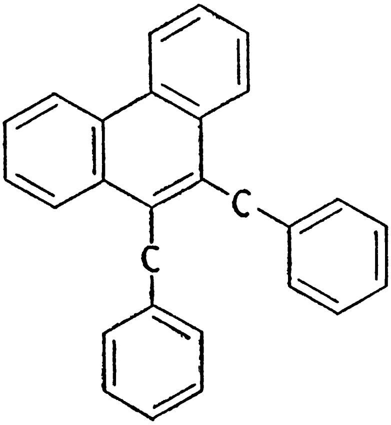
M. P., °C
279[41]
278–279[26]

1,4-Dimethyl-9,10-diphenylanthracene



M. P., °C
189[9]

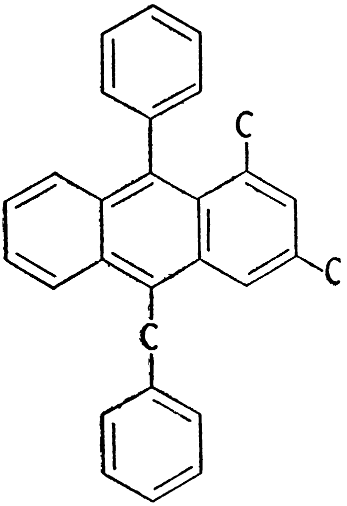
9,10-Dibenzylphenanthrene



M. P., °C
180–182[42]

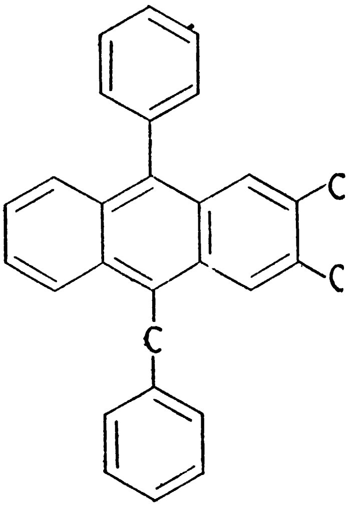
$C_{29}H_{24}$

1,3-Dimethyl-9-phenyl-10-benzylanthracene



M. P., °C
137[8]

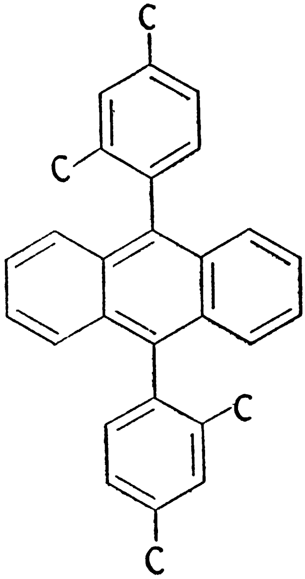
2,3-Dimethyl-9-phenyl-10-benzylanthracene



M. P., °C
163[10]

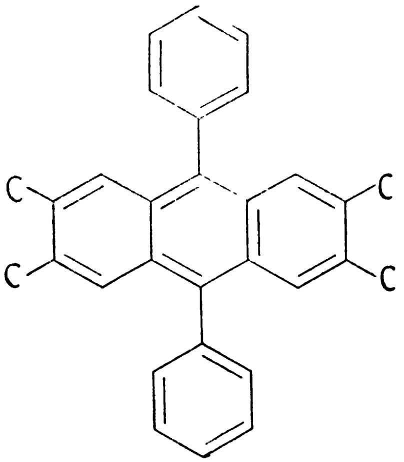
$C_{30}H_{26}$

9,10-Di-(2′,4′-dimethylphenyl)-anthracene



M. P., °C
290[17]

2,3,6,7-Tetramethyl-9,10-diphenylanthracene



M. P., °C
312[5]
284–285[33]

1-Methyl-7-isopropyl-x,x-diphenyl-phenanthrene (a)

M. P., °C

200[24]

(a) The structure of this compound was not clearly defined in the literature.

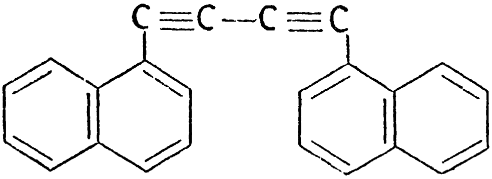
References on Anthracene or Phenanthrene with Two Phenyl Substitutions

1. Bachmann, W. E., J. Am. Chem. Soc. **56,** 1363 **1934.**
2. Bachmann, W. E., and J. M. Chemerda, J. Org. Chem. **4,** 583 **1939.**
3. Bachmann, W. E., and M. C. Kloetzel, J. Org. Chem. **2,** 356 **1937–38.**
4. Bachmann, W. E., and M. C. Kloetzel, J. Org. Chem. **3,** 55 **1938–39.**
5. Barnett, E. de B., J. Chem. Soc. **1939,** 348.
6. Barnett, E. de B., and J. W. Cook, J. Chem. Soc. **1928,** 566.
7. Barnett, E. de B., J. W. Cook, and J. L. Wiltshire, J. Chem. Soc. **1927,** 1724.
8. Barnett, E. de B., and C. L. Hewett, Ber. **64,** 1572 **1931.**
9. Barnett, E. de B., and J. A. Low, Ber. **64,** 49 **1931.**
10. Barnett, E. de B., and F. C. Marrison, Ber. **64,** 535 **1931.**
11. Barnett, E. de B., and M. A. Mathews, Ber. **59,** 1429 **1926.**
12. Bergmann, E., Ber. **63,** 1617 **1930.**
13. Bergmann, E., and S. Fujise, Ann. **480,** 188 **1930.**
14. Biltz, H., Ber. **38,** 203 **1905.**
15. Bradsher, C. K., and R. Rosher, J. Am. Chem. Soc. **61,** 1524 **1939.**
16. Bradsher, C. K., and E. S. Smith, J. Am. Chem. Soc. **65,** 451 **1943.**
17. Clar, E., Ber. **64,** 2194 **1931.**
18. Dufraisse, C., and R. Priou, Bull. soc. chim. [5] **5,** 611 **1938.**
19. Dufraisse, C., L. Velluz, and Mme. L. Velluz, Bull. soc. chim. [5] **5,** 1073 **1938.**
20. Duveen, D., and A. Willemart, J. Chem. Soc. **1939,** 116.
21. Guyot, A., and C. Staehling, Bull. soc. chim. [3] **33,** 1105 **1905.**
22. Guyot, A., and F. Vallette, Ann. chim. phys. [8] **23,** 363 **1911.**
23. Haack, E., Ber. **62,** 1771 **1929.**
24. Heiduschka, A., and H. Grimm, Arch. Pharm. **250,** 33 **1912.**
25. Hirshberg, Y., and L. Haskelberg, Trans. Faraday Soc. **39,** 45 **1943.**
26. Ingold, C. K., and P. G. Marshall, J. Chem. Soc. **1926,** 3080.
27. Julian, P., and W. Cole, J. Am. Chem. Soc. **57,** 1607 **1935.**
28. Kehrmann, F., R. Monier, and M. Ramm, Ber. **56,** 169 **1923.**
29. Koelsch, C. F., J. Org. Chem. **3,** 456 **1938.**
30. Lettré, H., H. Barnbeck, and W. Lege, Ber. **69,** 1151 **1936.**
31. Lippman, E., and R. Fritsch, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **113,** Abt. IIb, 429 **1904.**
32. Lippman, E., and I. Pollack, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **111,** Abt. IIb, 402 **1902.**
33. Müller, E., and E. Topel, Ber. **72,** 273 **1939.**
34. Schlenk, W., and E. Bergmann, Ann. **463,** 1 **1928.**
35. Schmidlin, J., and R. von Escher, Ber. **43A,** 1153 **1910.**
36. Schoepfle, C. S., and J. D. Ryan, J. Am. Chem. Soc. **54,** 3687 **1932.**
37. Scholl, R., and J. Donat, Ann. **512,** 1 **1934.**
38. Simonis, H., and P. Remmert, Ber. **48,** 206 **1915.**
39. Weizmann, C., E. Bergmann, and L. Haskelberg, J. Chem. Soc. **1939,** 391.
40. Werner, A., and A. Grob, Ber. **37,** 2887 **1904.**
41. Willemart, A., Bull. soc. chim. [5] **4,** 510 **1937.**
42. Willgerodt, C., and B. Albert, J. prakt. Chem. [2] **84,** 383 **1911.**

3. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-34}

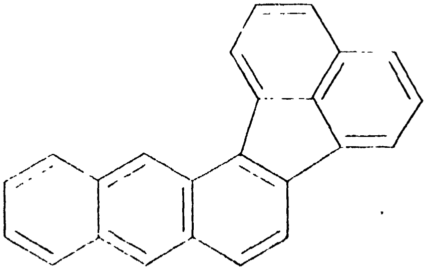
$C_{24}H_{14}$

Di-(1-naphthyl)-butadiyne



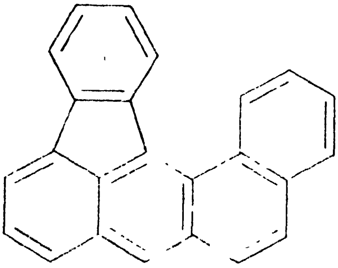
M. P., °C
171^{33}

1,2-(2′,1′-Acenaphtho)-anthracene



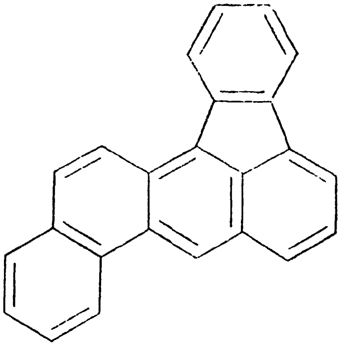
M. P., °C
$290\text{–}291^{63}$

Benzo-[a]-indo-[3,2,1-kl]-anthracene



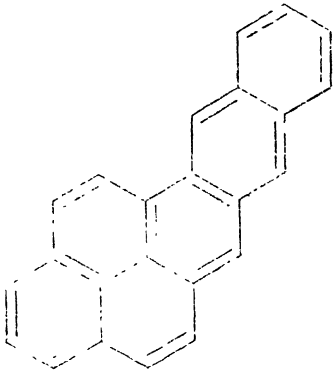
M. P., °C
$178\text{–}179^{29}$

1,2-Benzocholanthrylene



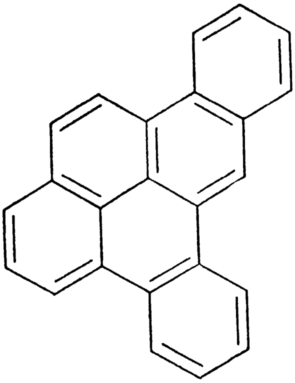
M. P., °C
$181\text{–}181.3^{29}$
$180.2\text{–}180.6^{76}$

1,2-(3′,2′-Naphtho)-pyrene



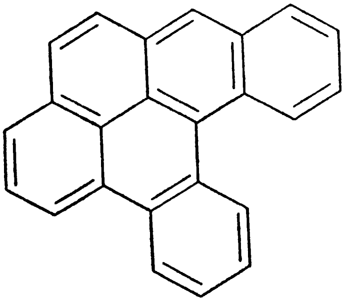
M. P., °C
273^{25}
$265\text{–}266^{17}$

1,2,4,5-Dibenzopyrene



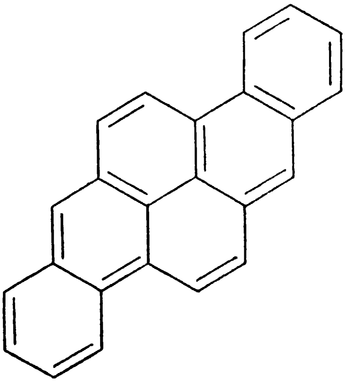
M. P., °C
238–239[31]
225[21]

2,3,4,5-Dibenzopyrene



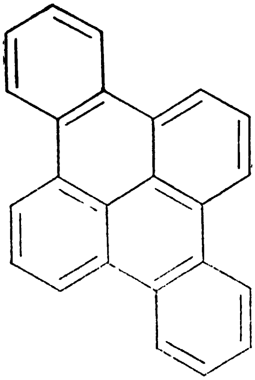
M. P., °C
226–227[16]

1,2,6,7-Dibenzopyrene



M. P., °C
315[66]
308[18]

4,5,9,10-Dibenzopyrene



M. P., °C
353–355[54]
340–342[21]

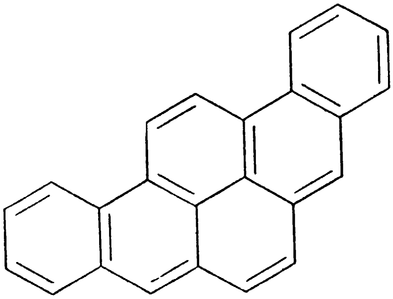
---

x,x,-Dibenzopyrene (a)

M. P., °C
320–320.5[77]

(a) The structure of this compound was not clearly defined in the literature.

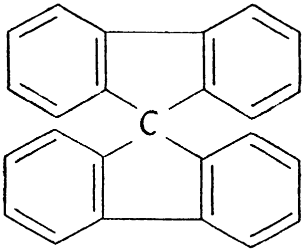
Benzo-[ghi]-picene



M. P., °C
281.5–282[58]
280[18]

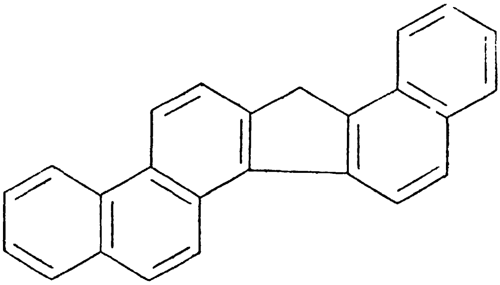
$C_{25}H_{16}$

Spiro[fluorene-9,9′-fluorene]



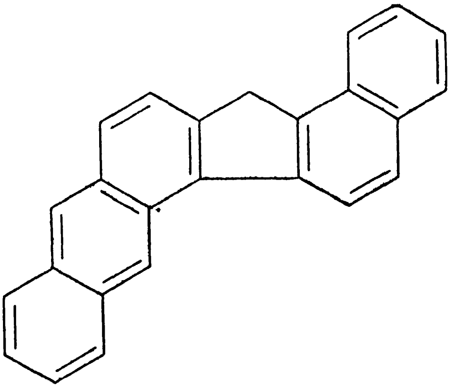
M. P., °C
198–199[22]

1,2-Benzo-5,6-(2′,1′-naphtho)-fluorene



M. P., °C
286–287[14]

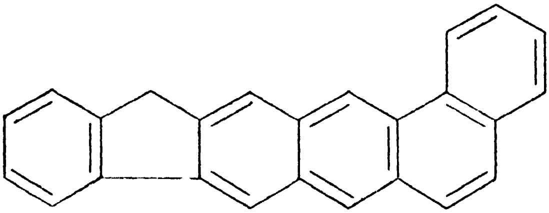
1,2-Benzo-5,6-(3′,2′-naphtho)-fluorene



M. P., °C
225[14]

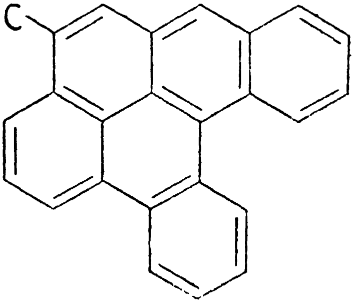
This series continued on next page

1,2-Benzo-6,7-(3′,2′-indo)-anthracene



M. P., °C
302–304[24]

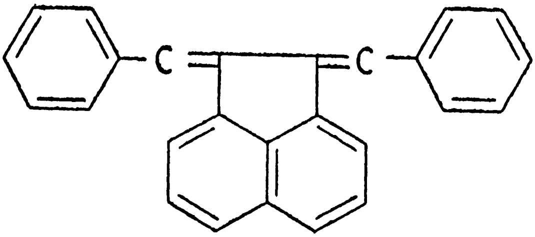
9-Methyl-2,3,4,5-dibenzopyrene



M. P., °C
225–226[15]

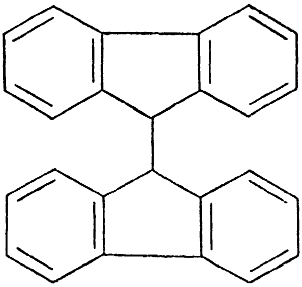
$C_{26}H_{18}$

1,2-Dibenzylideneacenaphthene



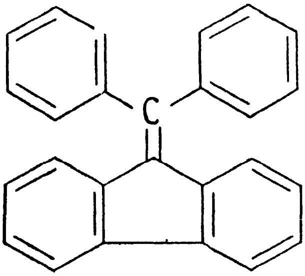
M. P., °C
142[46]

9,9′-Bifluoryl



M. P., °C
246.5
249^{44}
246–247$^{43, 69, 70}$
246$^{6, 28, 30}$
245^{61}
244–245$^{49, 74}$
242–244^{35}
241$^{47, 61}$
240$^{39, 55, 59}$

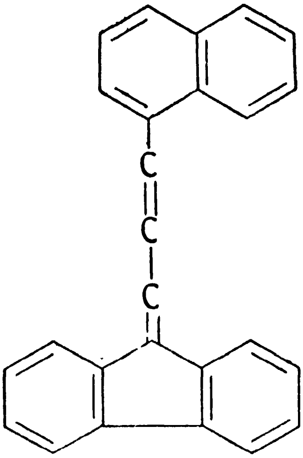
9-Benzhydrylidenefluorene



M. P., °C
229
229.5$^{37, 38, 40}$
229–229.5^{63}
228^{60}
225^{32}
224–225^{55}
223.5–224.5^{76}
213 (a)^{55}

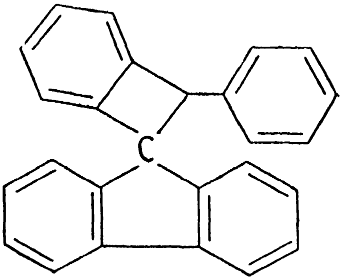
(a) This constant was determined on a stereoisomer of the compound.

1-(1′-Naphthyl)-3-(9″-fluorylidene)-propene-1



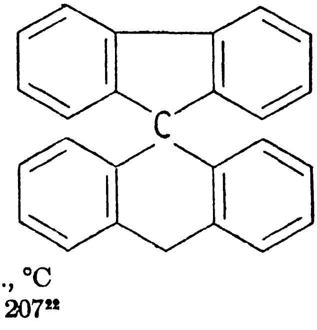
M. P., °C
174–175^{56}

Spiro[2-phenyl-3,4-benzocyclobutane-1,9′-fluorene]



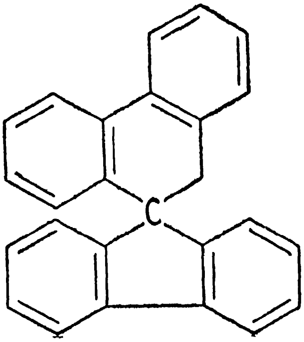
M. P., °C
235^{41}

Spiro[9,10-dihydroanthracene-9,9′-fluorene]



M. P., °C
207^{22}

Spiro[9,10-dihydrophenanthrene-9,9′-fluorene]



M. P., °C
195[62]

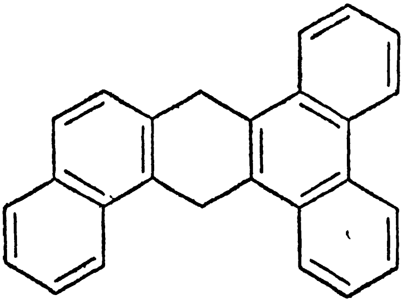
---

x,x-Dihydrohexacene (a)

M. P., °C
369–370[45]
357–358[19]

(a) The hydrogens are in either the 5, 16- or the 6, 15-positions.

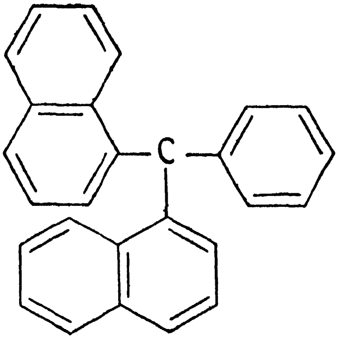
1,2,3,4,5,6-Tribenzo-9,10-dihydroanthracene



M. P., °C
281–283[1]

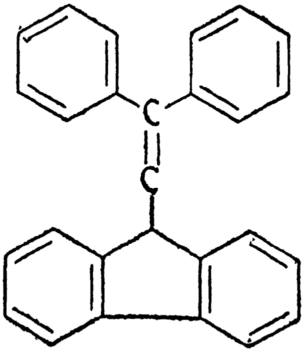
$C_{27}H_{20}$

Phenyldi-(1′-naphthyl)-methane



M. P., °C
288[36]
204[57]

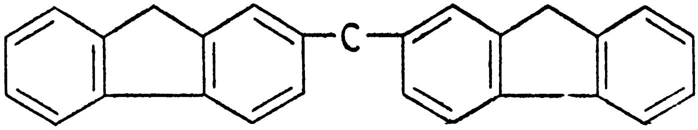
9-Fluorylbenzhydrylidenemethane



M. P., °C
111–112[55]

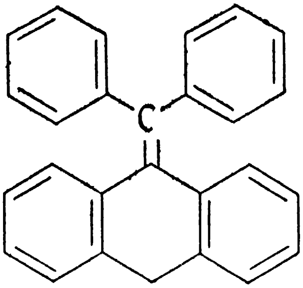
This series continued on next page

2,2′-Difluorylmethane



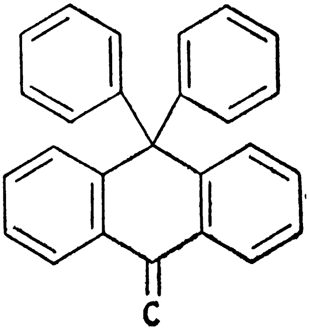
M. P., °C
201–202[27]

9-Benzhydrylidene-9,10-dihydroanthracene



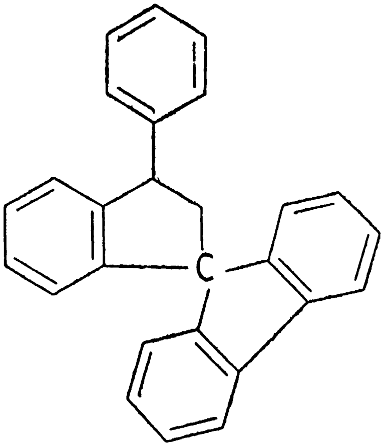
M. P., °C
256[50]

9,9-Diphenyl-10-methylene-9,10-dihydroanthracene



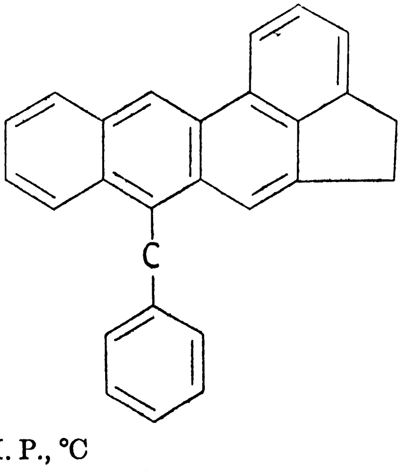
M. P., °C
192[2]
187[5]

Spiro[3-phenylindane-1,9′-fluorene]



M. P., °C
125–127[42]

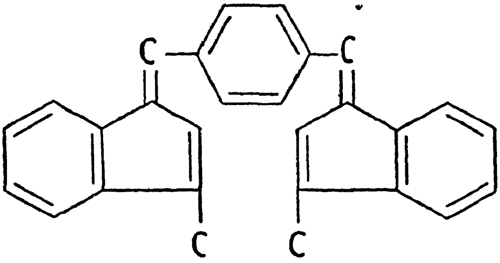
Indo-[4′,3′-ab]-10-benzylanthracene



M. P., °C
199–200[22]

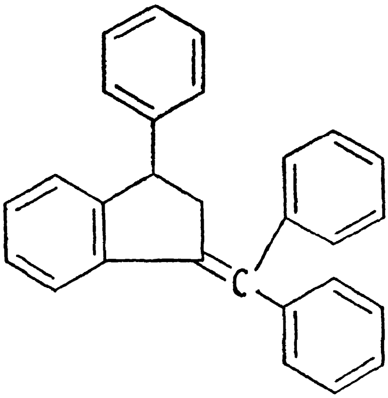
$C_{28}H_{22}$

1,4-Di-(3′-methylindenylidene-methyl)-benzene



M. P., °C
224[48]

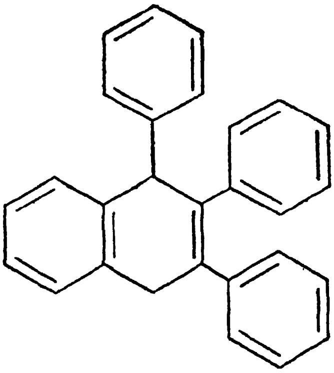
1-Phenyl-3-benzhydrylideneindane



M. P., °C
130-131.5 (a)[11]
130–131 (a)[11]
115–117 (a)[11]
115 (a)[11]
115[71]

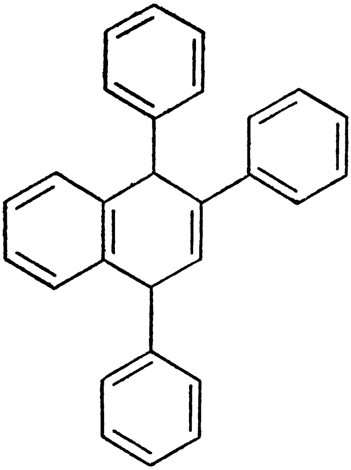
(a) These constants were determined on isomeric forms.

1,2,3-Triphenyl-1,4-dihydronaphthalene



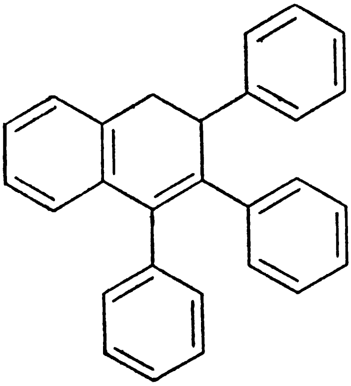
M. P., °C
165[8]

1,2,4-Triphenyl-1,4-dihydronaphthalene



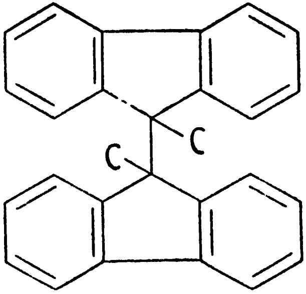
M. P., °C
142.5-144[10]

2,3,4-Triphenyl-1,2-dihydronaphthalene



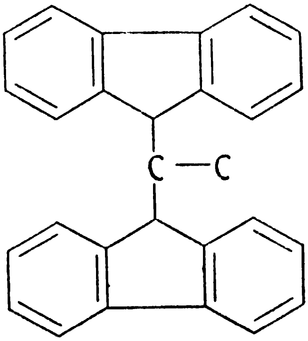
B. P., °C @ 760mm
215   0.5[9]

9,9′-Bi-(9-methylfluoryl)



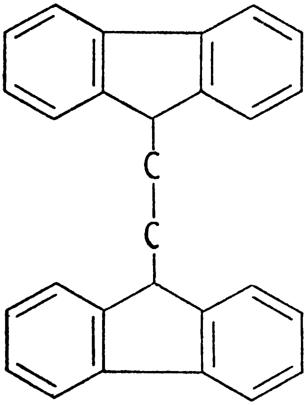
M. P., °C
209[64, 65]
206[72]

1,1-Di-(9′-fluoryl)-ethane



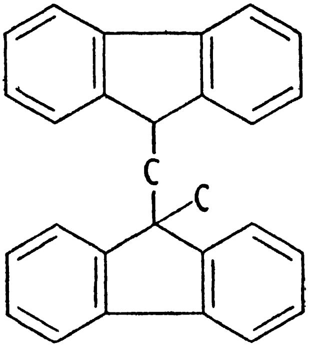
M. P., °C
262-263[52]

1,2-Di-(9′-fluoryl)-ethane



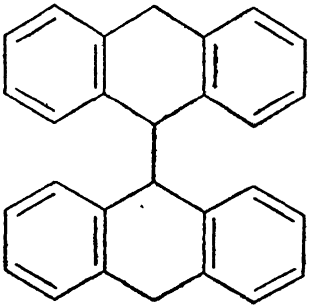
M. P., °C
224-225[72, 73]
218-219[7]

9-Fluoryl-[9′-(9′-methylfluoryl)]-methane



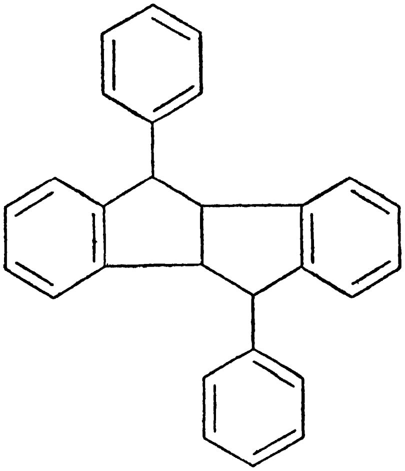
M. P., °C
171–171.5[72]

Bi-9,9′-(9,10-dihydroanthryl)



M. P., °C
255[55]
248–249[53]

2,3,6,7-Dibenzo-4,8-diphenylbicyclo-[3,3,0]-octane

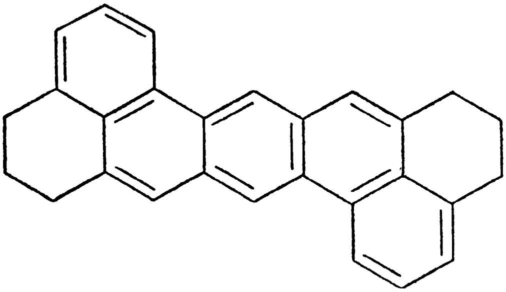


M. P., °C
207–208 (a)[12]
166–167 (a)[12]

(a) These constants were determined on isomeric forms.

This series continued on next page

Dibenzo-[de,op]-1,2,3,8,9,10-hexahydropentacene



M. P., °C
255–256^{20}

$C_{29}H_{24}$

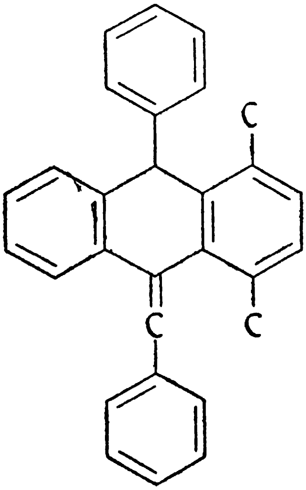
x-Benzyl-x-benzhydrylindene (a)

M. P., °C
137–138 (b)^{75}
130–131 (b)^{75}

(a) The structure of this compound was not clearly defined in the literature.

(b) These constants probably represent two different compounds.

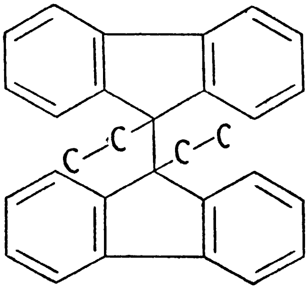
1,4-Dimethyl-9-phenyl-10-benzylidene-9,10-dihydroanthracene



M. P., °C
170^{3}

$C_{30}H_{26}$

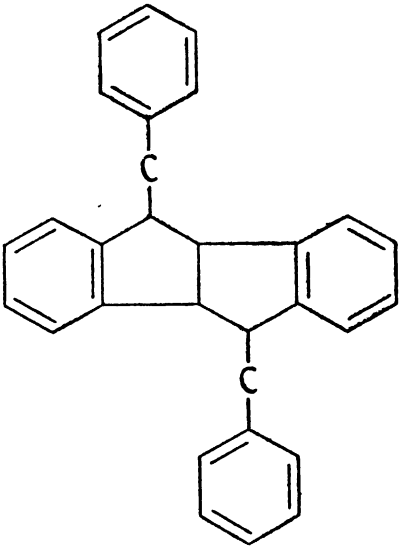
9,9′-Bi-(9-ethylfluoryl)



M. P., °C
210$^{64, 65}$

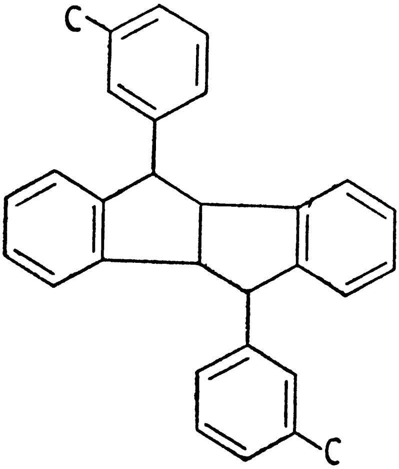
This series continued on next page

2,3,6,7-Dibenzo-4,8-dibenzylbicyclo-[3,3,0]-octane



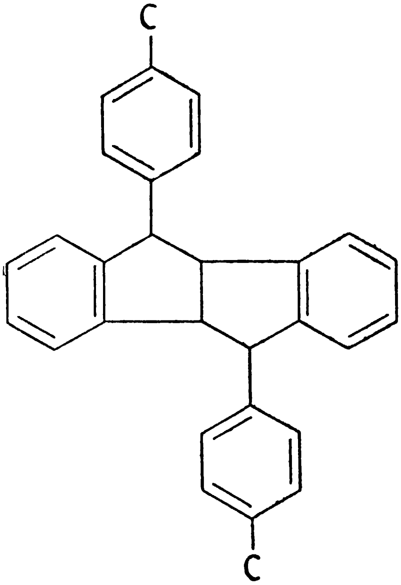
M. P., °C
141[13]

2,3,6,7-Dibenzo-4,8-di-*m*-tolylbicyclo-[3,3,0]-octane



M. P., °C
150[12]

2,3,6,7-Dibenzo-4,8-di-*p*-tolylbicyclo-[3,3,0]-octane

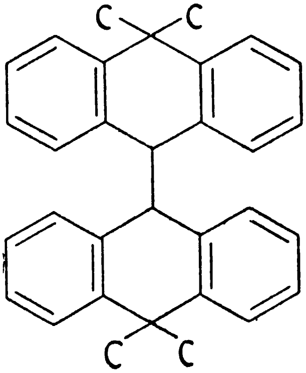


M. P., °C
188–189 (a)[12]
145–146 (a)[12]

(a) These constants were determined on isomeric forms.

$C_{32}H_{30}$

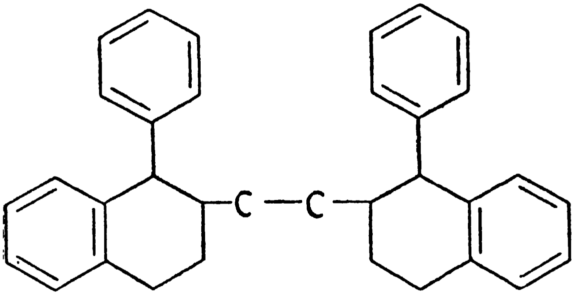
9,9-Bi-(10,10-dimethyl-9,10-dihydroanthryl)



M. P., °C
315[4]

$C_{34}H_{34}$

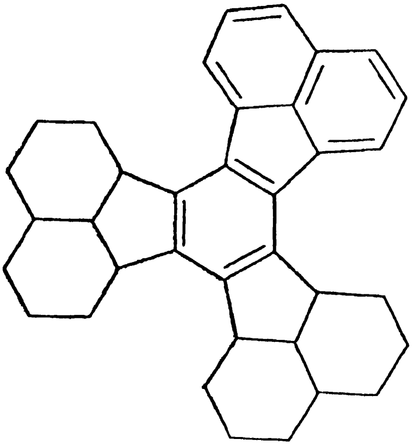
1,2-Di-[2′-(1′-phenyl-1′,2′,3′,4′-tetrahydronaphthyl)]-ethane



M. P., °C
169.5–170.5[34]

$C_{36}H_{38}$

1,2-(2′,1′-Acenaphtho)-3,4,5,6-di-[2″,1″-(2a″,3″,4″,5″,5a″,6″,7″,8″,8a″,8b″-decahydroacenaphtho)]-benzene



M. P., °C
245[67]

References in Miscellaneous Polynuclear Aromatics of Empirical Formula C_nH_{2n-34}

1. Bachmann, W. E., and L. H. Pence, J. Am. Chem. Soc. **59,** 2339 **1937.**
2. Barnett, E. de B., and J. W. Cook, J. Chem. Soc. **1928,** 566.
3. Barnett, E. de B., and J. A. Low, Ber. **64,** 49 **1931.**
4. Barnett, E. de B., and M. A. Matthews, Ber. **59,** 767 **1926.**
5. Bergmann, E., and A. Bondi, Ber. **66,** 286 **1933.**
6. Bergmann, E., and S. Fujise, Ann. **483,** 65 **1930.**
7. Bergmann, E., H. Hoffmann, and D. Winter, Ber. **66,** 46 **1933.**
8. Bergmann, E., and O. Zwecker, Ann. **487,** 155 **1931.**
9. Bergmann, F., D. Schapiro, and H. E. Eschinazi, J. Am. Chem. Soc. **64,** 559 **1942.**
10. Blum, O., Ber. **62,** 881 **1929.**
11. Blum-Bergmann, O., Ann. **484,** 26 **1930.**
12. Brand, K., and W. Mühl, J. prakt. Chem. [2] **110,** 1 **1925.**
13. Brand, K., and K. O. Müller, Ber. **55,** 601 **1922.**
14. Buu-Hoï and P. Cagniant, Rev. sci. **80,** 381 **1945;** C. A. **39,** 3277 **1945.**
15. Clar, E., "Aromatische Kohlenwasserstoffe," Springer-Verlag, Berlin, **1941,** p. 213.
16. Clar, E., Ber. **63,** 112 **1930.**
17. Clar, E., Ber. **69,** 1671 **1936.**
18. Clar, E., Ber. **72,** 1645 **1939.**
19. Clar, E., Ber. **72,** 1817 **1939.**
20. Clar, E., Ber. **73,** 409 **1940.**
21. Clar, E., Ber. **76,** 609 **1943.**
22. Clarkson, R. G., and M. Gomberg, J. Am. Chem. Soc. **52,** 2881 **1930.**

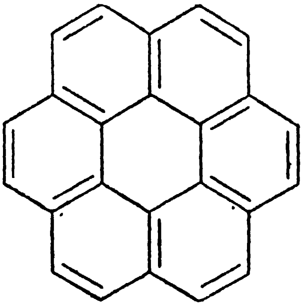
23. Cook, J. W., J. Chem. Soc. **1930,** 1087.
24. Cook, J. W., J. Chem. Soc. **1931,** 499.
25. Cook, J. W., C. L. Hewett, and I. Hieger, J. Chem. Soc. **1933,** 395.
26. Davis, W. W., M. E. Krahl, and G. H. A. Clowes, J. Am. Chem. Soc. **62,** 3080 **1940.**
27. Dziewoński, K., and M. Panek, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1927A,** 745.
28. Eckert, A., J. prakt. Chem. [2] **121,** 278 **1929.**
29. Fieser, L. F., and A. M. Seligman, J. Am. Chem. Soc. **57,** 2174 **1935.**
30. Graebe, C., and H. Stindt, Ann. **291,** 1 **1896.**
31. Grechkin, N. P., and A. E. Arbusov, Compt. rend. acad. sci. U. R. S. S. **32,** 50 **1941;** Survey For. Petrol. Liter. No. 342, Jan. 16, **1942.**
32. Grignard, V., and C. Courtot, Compt. rend. **152,** 1493 **1911.**
33. Grignard, V., and H. Perrichon, Ann. chim. [10] **5,** 5 **1926.**
34. Hewett, C. L., J. Chem. Soc. **1936,** 596.
35. Ingold, C. K., and J. A. Jessop, J. Chem. Soc. **1930,** 713.
36. Kashtanov, L. I., J. Gen. Chem. (U. S. S. R.) **4,** 1204 **1934;** C. A. **29,** 3328 **1935.**
37. Kaufmann, V., Ber. **29,** 73 **1896.**
38. Kaufmann, V., Chem. Ztg. **19,** 1033 **1895.**
39. Kliegl, A., Ber. **62,** 1327 **1929.**
40. Klinger, H., and C. Lonnes, Ber. **29,** 734 **1896.**
41. Klinger, H., and C. Lonnes, Ber. **29,** 2152 **1896.**
42. Koelsch, C. F., J. Am Chem. Soc. **55,** 3394 **1933.**
43. Maitland, P., and S. H. Tucker, J. Chem. Soc. **1929,** 2559.
44. Manchot, W., and P. Krische, Ann. **337,** 170 **1904.**
45. Marschalk, C., Bull. soc. chim. [5] **6,** 1112 **1939.**
46. Maxim, N., Bull. soc. chim. [4] **45,** 1137 **1929.**
47. Mayer, F., Ber. **46,** 2579 **1913.**
48. Mayer, F., A. Sieglitz, and W. Ludwig, Ber. **54,** 1397 **1921.**
49. Miller, H. F., and J. Bachman, J. Am. Chem. Soc. **57,** 766 **1935.**
50. Nenitzescu, C. D., I. Gavât, and D. Cocora, Ber. **72,** 819 **1939.**
51. Oliveri-Mandalá, E., G. Caronna, and E. Deleo, Gazz. chim. ital. **68,** 327 **1938.**
52. Pummerer, R., and G. Dorfmüller, Ber. **46,** 2386 **1913.**
53. Sachse, H., Ber. **21,** 2512 **1888.**
54. Sako, S., Bull. Chem. Soc. Japan **9,** 55 **1934.**
55. Schlenk, W., and E. Bergmann, Ann. **463,** 1 **1928.**
56. Schlenk, W., and E. Bergmann, Ann. **479,** 42 **1930.**
57. Schoepfle, C. S., J. Am. Chem. Soc. **44,** 188 **1922.**
58. Scholl, R., and H. Neumann, Ber. **55,** 118 **1922.**
59. Schönberg, A., A. Stephenson, H. Kaltschmitt, E. Peterson, and H. Schulten, Ber. **66,** 237 **1933.**
60. Staudinger, H., and N. Kon, Ann. **384,** 38 **1911.**
61. Stollé, R., H. Munzel, and F. Wolf, Ber. **46,** 2339 **1913.**
62. Suszko, J., and R. Schillak, Roczniki Chem. **14,** 1216 **1934;** C. A. **29,** 6231 **1935;** Chem. Zentr. **1935,** I, 2361.
63. Szperl, L., and T. Wierusz-Kowalski, Chem. Polski **15,** 19, 23, 28; Chem. Zentr. **1918,** I, 908.
64. Vansheidt, A., and B. Moldavski, Ber. **64,** 917 **1931.**
65. Vansheidt, A., and B. Moldavski, J. Gen. Chem. (U. S. S. R.) **1,** 304 **1931;** Chem. Zentr. **1931,** II, 3208.
66. Vollmann, H., H. Becker, M. Corell, and H. Streeck, Ann. **531,** 1 **1937.**
67. von Braun, J., Ber. **67,** 214 **1934.**
68. von Braun, J., and G Manz, Ann. **496,** 170 **1932.**
69. Weissgerber, R., Ber. **34,** 1659 **1901.**
70. Weissgerber, R., Ber. **41,** 2913 **1908.**
71. Wieland, H., and H. Kloss, Ann. **470,** 201 **1929.**
72. Wieland, H., and O. Probst, Ann. **530,** 274 **1937.**
73. Wislicenus, W., Ber. **48,** 617 **1915.**
74. Wislicenus, W., and K. Russ, Ber. **43,** 2719 **1910.**
75. Wuest, H.-M., Ann. **415,** 291 **1918.**
76. Zedlitz, O., Ber. **64,** 2424 **1931.**
77. Zilberman, G. B., J. Gen. Chem. (U. S. S. R.) **7,** 234 **1937;** C. A. **31,** 4314 **1937;** Chem. Zentr. **1937,** I, 4787.

XVI. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-36}

XVI. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-36}

$C_{24}H_{12}$

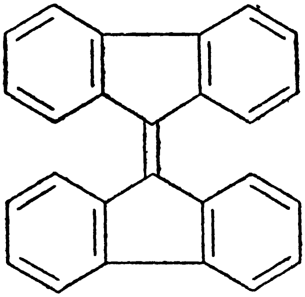
Coronene



M. P., °C
435[35]
429–430[68]

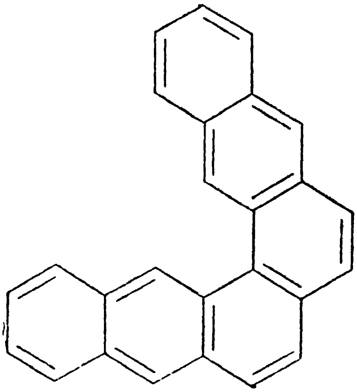
$C_{26}H_{16}$

9,9′-Bifluorylidene



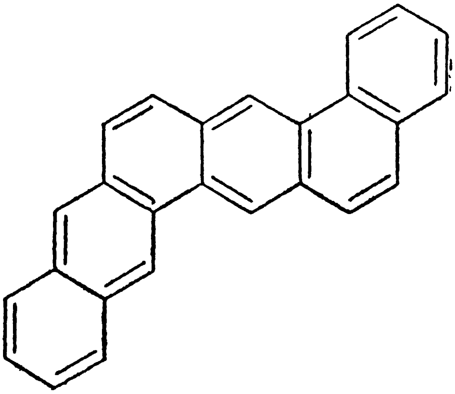
M. P., °C
187.5
189–190[27, 40, 44]
189[50, 53]
187–189[43]
188[39, 77]
187–188[38, 72]
187[42, 70, 76, 84]
186–187[66]
185[69]
184[41, 63]

1,2-(4′,3′-Anthro)-anthracene



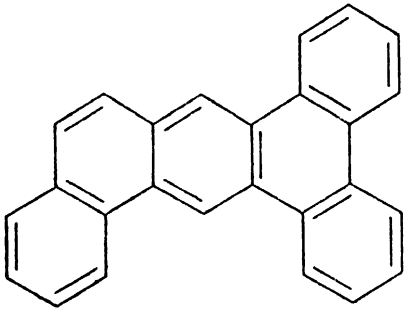
M. P., °C
308[24]
304[26]

1,2-Benzo-5,6-(3′,2′-naphtho)-anthracene



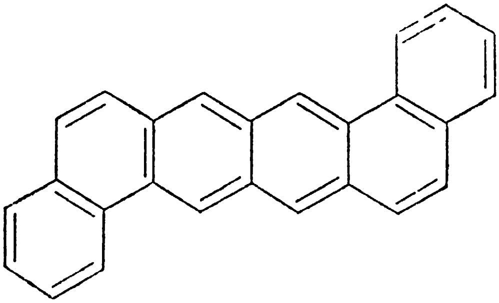
M. P., °C
281–282[25]
281[82]

1,2,3,4,5,6-Tribenzoanthracene



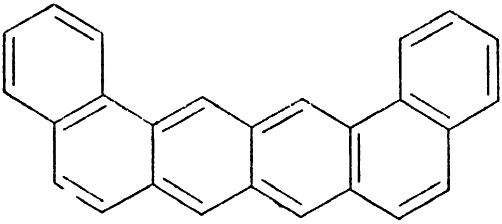
M. P., °C
224[34]
223[26]

1,2,7,8-Dibenzonaphthacene



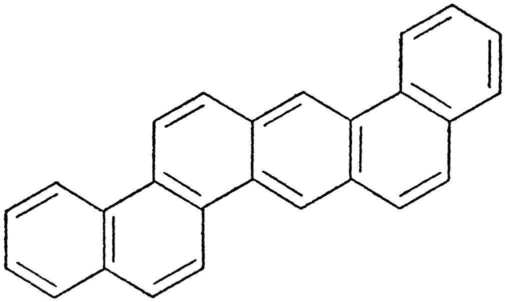
M. P., °C
345[28]

1,2,9,10-Dibenzonaphthacene



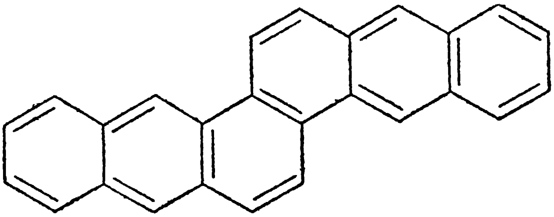
M. P., °C
341–343[25]

2,3-(4′,3′-Naphtho)-chrysene
(3,4,8,9-Dibenztetraphene)



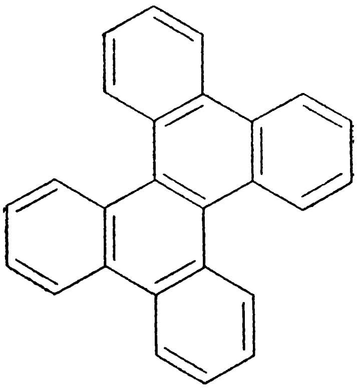
M. P., °C
385[23]

2,3,8,9-Dibenzochrysene



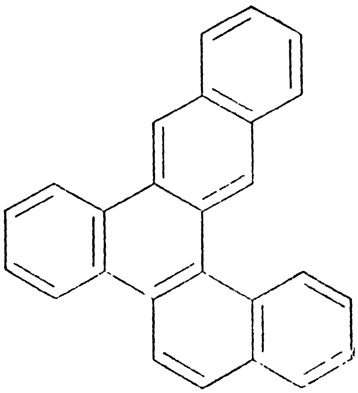
M. P., °C
389[26]

5,6,11,12-Dibenzochrysene



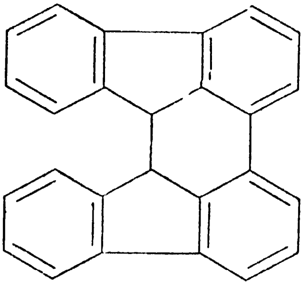
M. P., °C
218[76]
215[8]

2,3,5,6-Dibenzotriphenylene



M. P., °C
185–186[13]

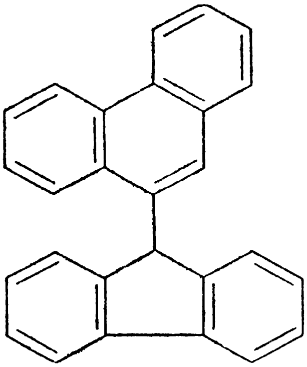
Difluoro-[1,9-ab,8′,9′-de]-cyclohexane
(1,9,8′,9′-Bifluorylene)



M. P., °C
218[31, 33]

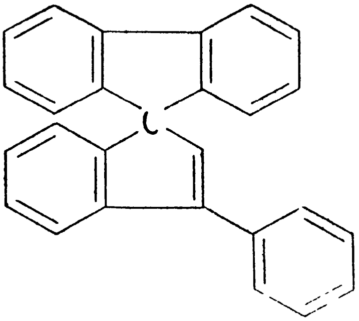
$C_{27}H_{18}$

9-(9′-Fluoryl)-phenanthrene



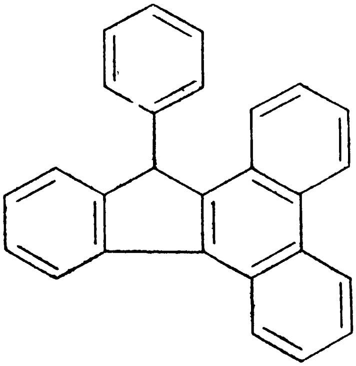
M. P., °C
196–197[1]

Spiro[3-phenylindene-1,9′-fluorene]



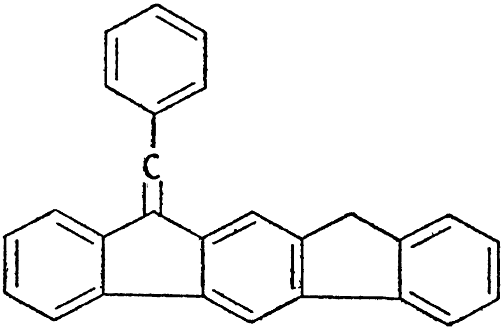
M. P., °C
194–197[47]
140–141[45]

1,2,3,4-Dibenzo-9-phenylfluorene



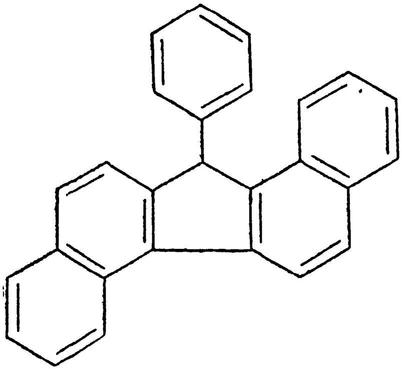
M. P., °C
210–211[1, 46]
209[48]

2,3-(2′,3′-Indo)-9-benzylidenefluorene



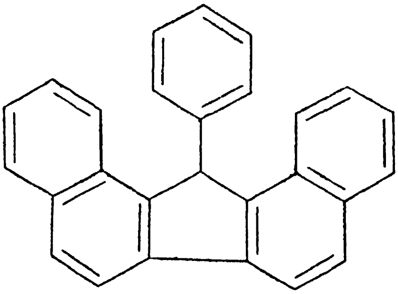
M. P., °C
107[57]

1,2,5,6-Dibenzo-9-phenylfluorene



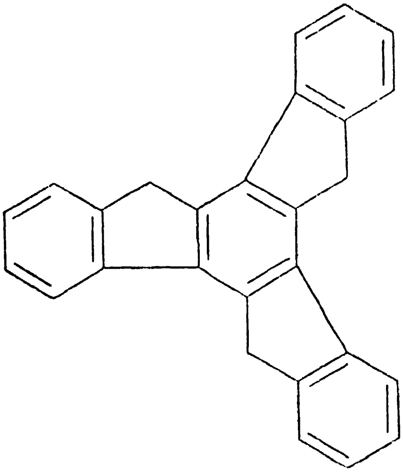
M. P., °C
219–219.5[12]

1,2,7,8-Dibenzo-9-phenylfluorene



M. P., °C
273[67]
148.5–149.5[12]

1,2,3,4,5,6-Tri-(3′,2′-indo)-benzene
(Truxene) (a)

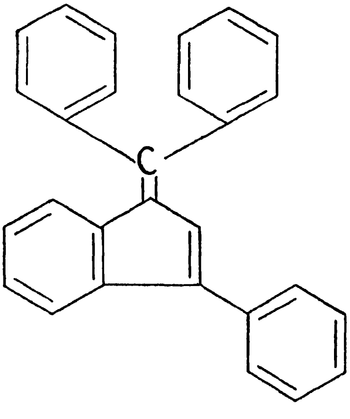


M. P., °C
391[71]
369–370[74]
368[2]
365[78]
364–365[30]
330[73]

(a) This compound was thought by some investigators to be 2,3,2′,3′-Biindenylene or 2,3,3′,2′-Biindenylene.

$C_{28}H_{20}$

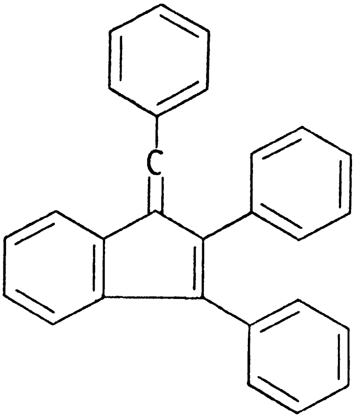
1-Benzhydrylidene-3-phenylindene



M. P., °C
207–208[17]

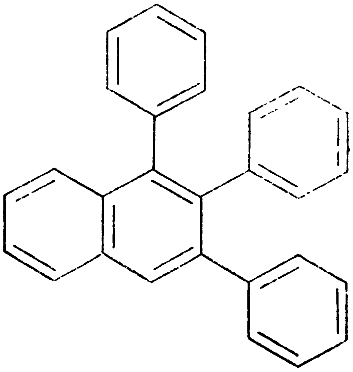
207[18, 19]
205–206[80, 87, 88]

1-Benzylidene-2,3-diphenylindene



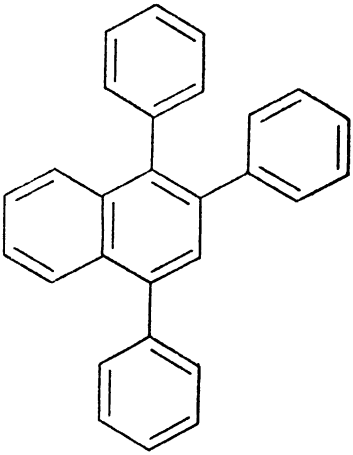
M. P., °C
184–185[58, 59, 61]

1,2,3-Triphenylnaphthalene



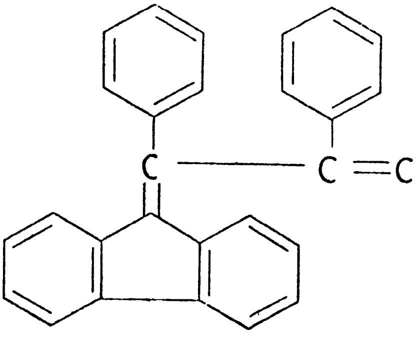
M. P., °C
153–154[11]
152–153.5[21]
151[65]

1,2,4-Triphenylnaphthalene



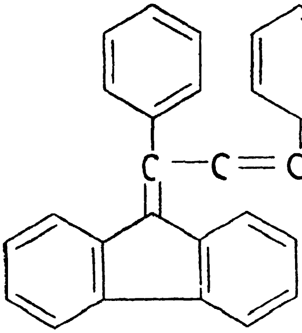
M. P., °C
158–159[15]

1-(9′-Fluorylidene)-1,2-diphenylpropene-2



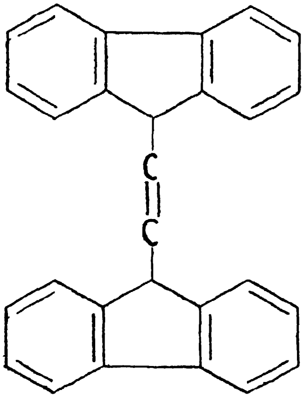
M. P., °C
197–198[49]

1-(9′-Fluorylidene)-1,3-diphenylpropene-2



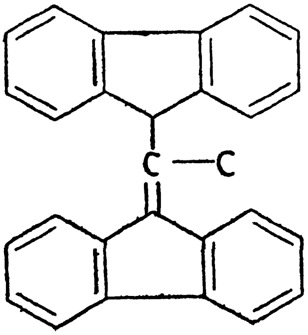
M. P., °C
183–184[9]

1,2-Di-(9′-fluoryl)-ethene



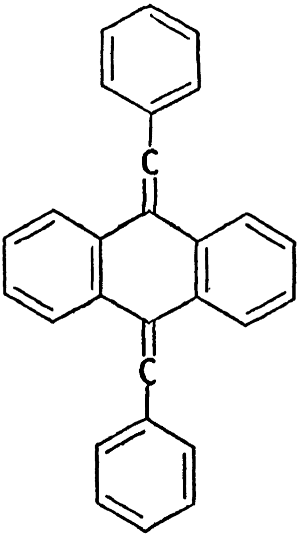
M. P., °C
267–268[83]
267[81]

9-Fluoryl-9′-fluorylidenemethylmethane



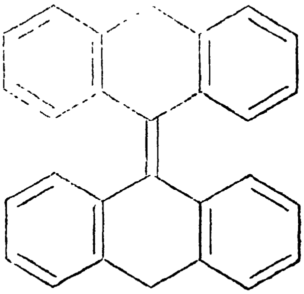
M. P., °C
>350[62]

9,10-Dibenzylidene-9,10-dihydroanthracene



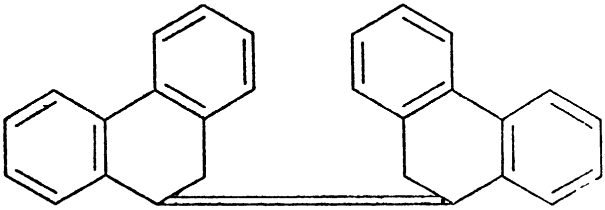
M. P., °C
237–240[51]
234–236[51]
199–200[7]

9,9′-Bi-9,10-dihydroanthrylidene



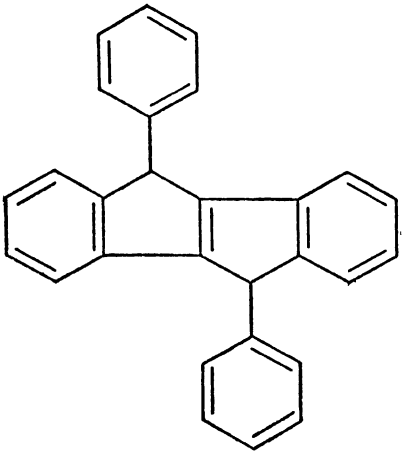
M. P., °C
298–300[55]

9,9′-Bi-9,10-dihydrophenanthrylidene



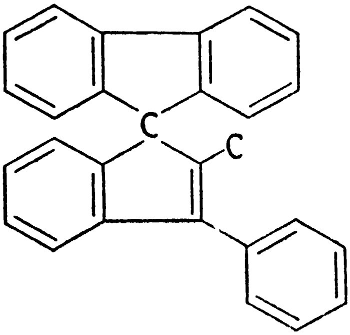
M. P., °C
303[6]

2,3,6,7-Dibenzo-4,8-diphenylbicyclo-[3,3,0]-octene-1,5



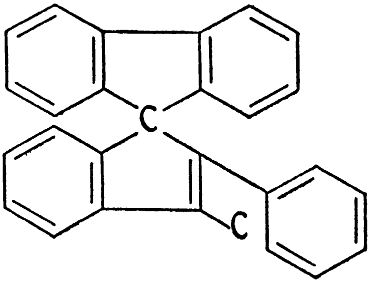
M. P., °C
285–286[20]

Spiro[2-methyl-3-phenylindene-1,9′-fluorene]



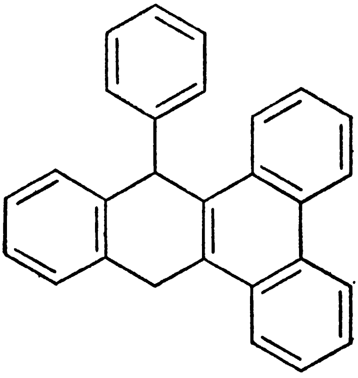
M. P., °C
173–174.5[49]

Spiro[2-phenyl-3-methylindene-1,9′-fluorene]



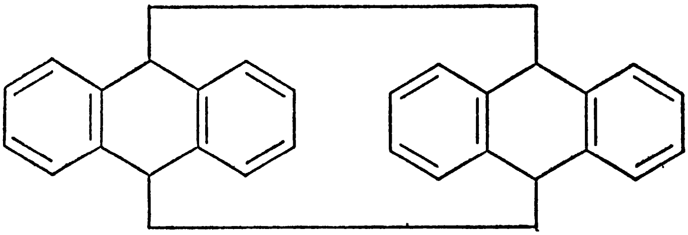
M. P., °C
152.5–153.5[49]

1,2,3,4-Dibenzo-9-phenyl-9,10-dihydroanthracene



M. P., °C
192[10]

9,10,9′,10′-Bi-(9,10-dihydroanthrylene)
(Paranthracene)

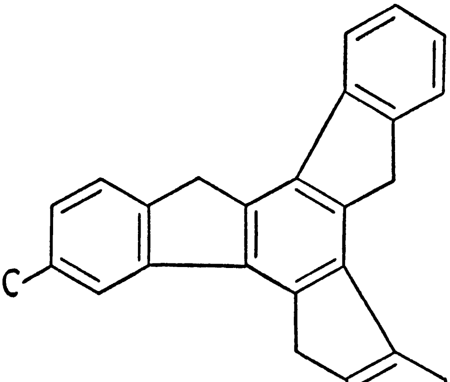


M. P., °C
243.5
244[4, 11, 78]
242–244[61]
242–243[86]
240[52]

D_4^{20}
1.265[61]
1.261 (a)[14]

(a) The temperature of this determination was not given.

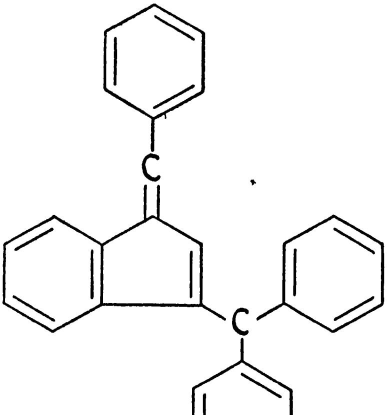
1,2,3,4-Di-(3′,2′-indo)-5,6-[3″,2″-(5″-methylindo)]-benzene



M. P., °C
423[71]

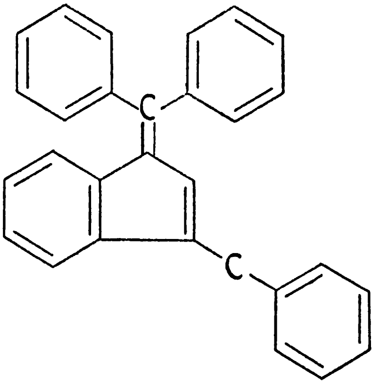
$C_{29}H_{22}$

1-Benzylidene-3-benzhydrylindene



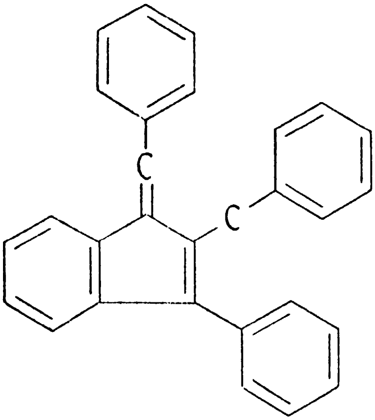
M. P., °C
131.5–132.5[85]
130[28]

1-Benzhydrylidene-3-benzylindene



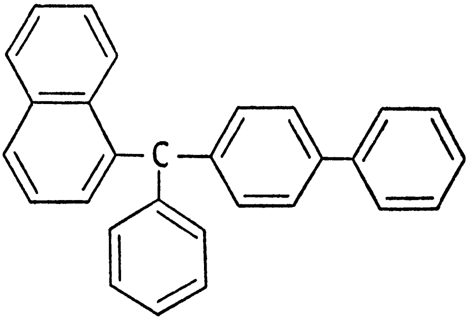
M. P., °C
130–130.5[85]

1-Benzylidene-2-benzyl-3-phenylindene



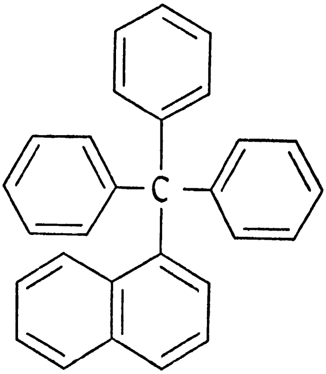
M. P., °C
177.5–179[16]
174–175[60]

1-Naphthyl-*p*-biphenylylphenylmethane



M. P., °C
281–282[3]

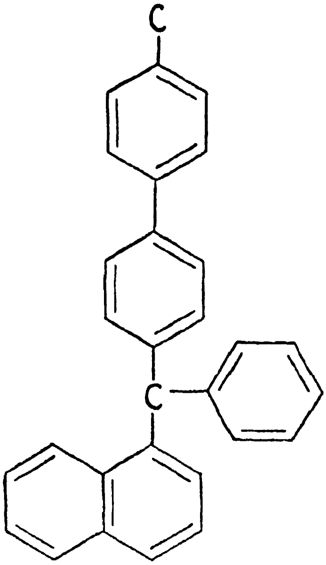
1-Naphthyltriphenylmethane



M. P., °C
193[79]

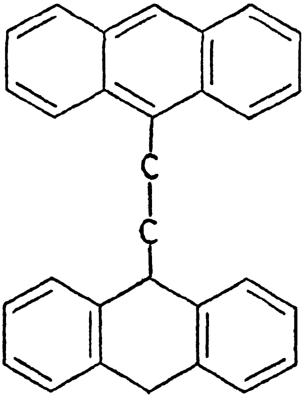
$C_{30}H_{24}$

1-Naphthyl-(4′-methyl-*p*-biphenylyl)-phenylmethane



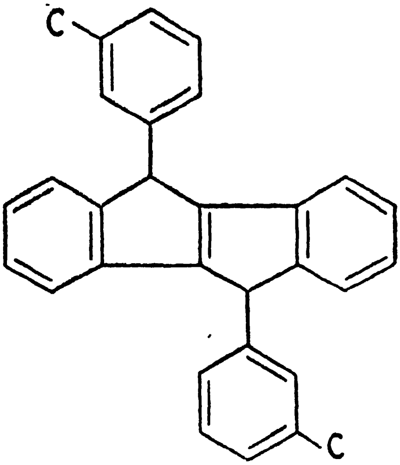
M. P., °C
171[37]

1-(9′-Anthryl)-2-[9″-(9″,10″-dihydroanthryl)]-ethane



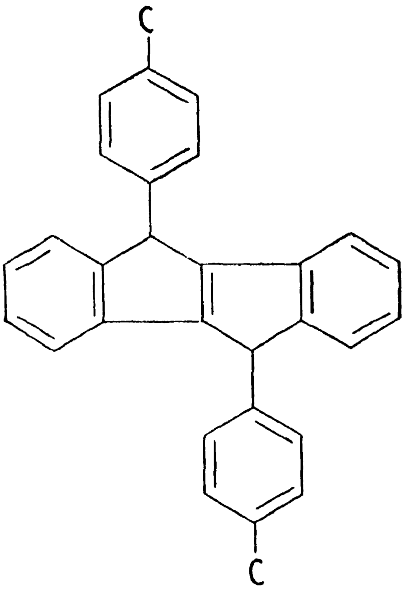
M. P., °C
308[5]

2,3,6,7-Dibenzo-4,8-di-*m*-tolylbicyclo-[3,3,0]-octene-1,5



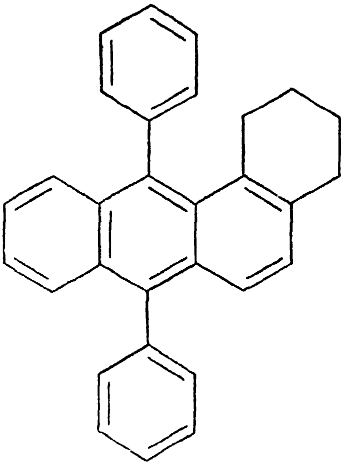
M. P., °C
179–180[20]

2,3,6,7-Dibenzo-4,8-di-*p*-tolylbicyclo-[3,3,0]-octene-1,5



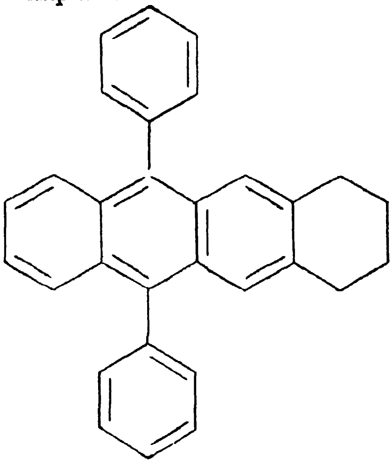
M. P., °C
200[20]

1,2-Cyclohexano-9,10-diphenylanthracene



M. P., °C
235–236[56]

6,11-Diphenyl-1,2,3,4-tetrahydronaphthacene



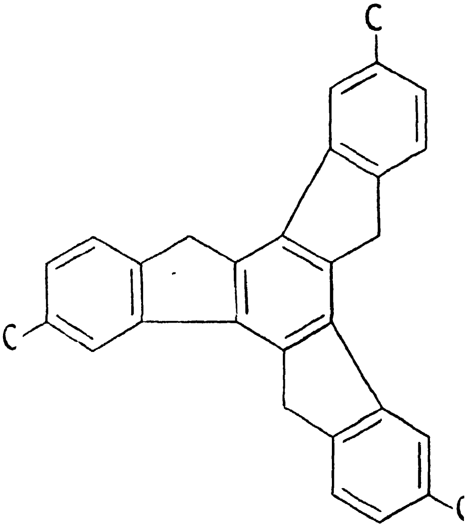
M. P., °C
298[29]

---

x_6-Hexahydroheptacene (a)
M. P., °C
354[54]

(a) The structure of this compound was not clearly defined in the literature.

1,2,3,4,5,6-Tri-[3′,2′-(5′-methylindo)]-benzene



M. P., °C
447[71]

α-Diphenyltruxane (a)
M. P., °C
201–202[75]

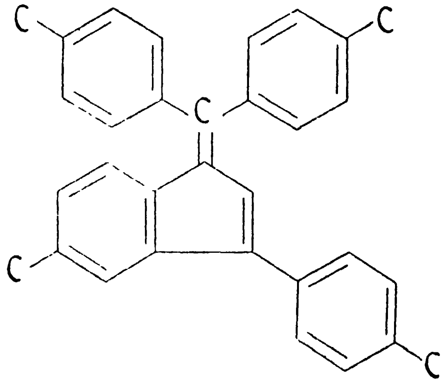
(a) The structure of this compound was not clearly defined in the literature.

γ-Diphenyltruxane (a)
M. P., °C
169–171[75]

(a) The structure of this compound was not clearly defined in the literature.

$C_{32}H_{28}$

1-(Di-*p*-tolylmethylene)-3-*p*-tolyl-5-methylindene



M. P., °C
192–193[22]

$C_{36}H_{36}$

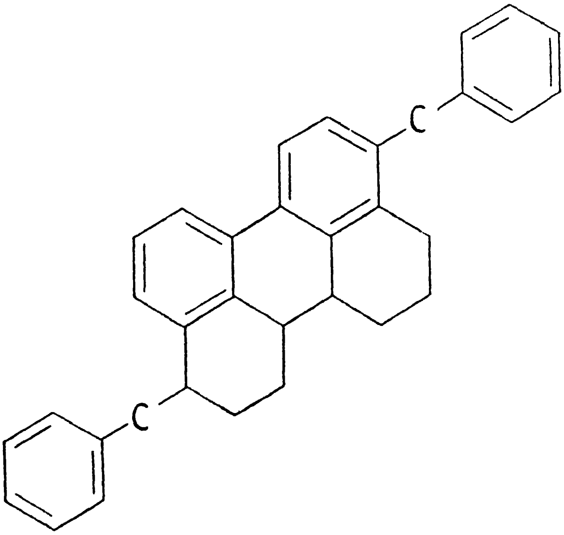
1,2,3,4,5,6-Tri-[3′,2′-(x$_6$-hexahydronaphtho)-cyclobutano]-benzene (a)

M. P., °C
124–128[32]

(a) The structure of this compound was not clearly defined in the literature.

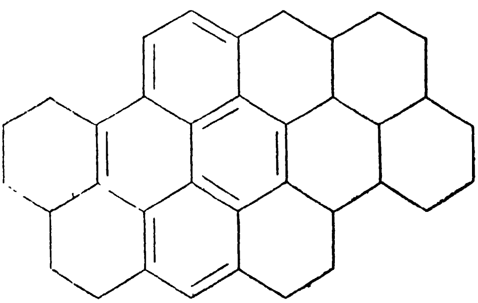
$C_{34}H_{32}$

3,9-Dibenzyl-4,5,6,6a,6b,7,8,9-octahydroperylene



M. P., °C
154[89]

Didecahydronaphtho-[2′,1′,8′-bcd, 2″,1″,8″-klm]-1,2,2a,3,4,4a,5,6-octahydrocoronene



M. P., °C
340^{35}

References on Polynuclear Aromatics of Empirical Formula C_nH_{2n-36}

1. Bachmann, W. E., J. Am. Chem. Soc. **56,** 1363 **1934.**
2. Backer, H. J, and H. B. J. Schrink, Rec. trav. chim **50,** 1066 **1931.**
3. Banus, A G., and J. Monche, Anales soc. españ. fís quím. **33,** 655 **1935;** Chem. Zentr. **1936,** II, 2130.
4. Barberio, M., Gazz. chim. ital. **33,** II, 460 **1903.**
5. Barnett, E. de B., and M. A. Matthews, Ber. **59,** 767 **1926.**
6. Bergmann, E., and F. Bergmann, J. Am. Chem. Soc. **59,** 1443 **1937.**
7. Bergmann, E., and S. Fujise, Ann. **480,** 188 **1930.**
8. Bergmann, E., and S. Fujise, Ann. **483,** 65 **1930.**
9. Bergmann, E, and T. Ukai, Ber. **66,** 54 **1933.**
10. Bergmann, E., and O. Zwecker, Ann. **487,** 155 **1931.**
11. Bergmann, F., D. Schapiro, and H. E. Eschinazi, J. Am. Chem. Soc. **64,** 559 **1942.**
12. Berliner, E., J. Am. Chem. Soc. **64,** 2894 **1942.**
13. Beyer, H., and J. Richter, Ber. **73,** 1319 **1940.**
14. Bhatnagar, S. S., M B. Nevgi, and R. N. Mathur, Z. Physik **100,** 141 **1936.**
15. Blum, O., Ber. **62,** 881 **1929.**
16. Blum-Bergmann, O., J. Chem. Soc. **1935,** 1020.
17. Brand, K., Ber. **54,** 1987 **1921.**
18. Brand, K., and L. W. Berlin, Ber. **57,** 816 **1924.**
19. Brand, K., and O. Horn, J. prakt. Chem. **115,** 351 **1927.**
20. Brand, K., and W. Mühl, J. prakt. Chem. [2] **110,** 1 **1925.**
21. Brand, K., and H. W. Stephan, Ber. **72,** 2168 **1939.**
22. Brand, K., and G. Wendel, J. prakt. Chem. [2] **115,** 335 **1927.**
23. Clar, E., Ber. **76,** 119 **1943.**
24. Clar, E., H. Wallenstein, and R. Avenarius, Ber. **62,** 950 **1929.**
25. Cook, J. W., J. Chem. Soc. **1931,** 499.
26. Cook, J. W., I. Hieger, E. L. Kennaway, and W. V Mayneord, Proc. Roy. Soc. (London) **111B,** 455 **1932.**
27. Courtot, C., Ann chim. [9] **4,** 168 **1915.**
28. Courtot, C., Ann. chim. [9] **5,** 52 **1916.**
29. Dufraisse, C., and R. Horclois, Bull' soc. chim. [5] **3,** 1894 **1936.**
30. Dziewoński, K., and J. Podgórska, Bull. intern. acad. sci. Cracovie **1915A,** 8.
31. Dziewoński, K., and J. Suszko, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1921A,** 67.
32. Dziewoński, K., and J. Suszko, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1923A,** 17.
33. Dziewoński, K., and J. Suszko, Roczniki Chem. **1,** 387 **1921;** C. A. **17,** 1159 **1921.**
34. Fieser, L. F., and E. M. Dietz, Ber. **62,** 1827 **1929.**
35. Fromherz, H., L. Thaler, and G. Wolf, Z. Elektrochem. **49,** 387 **1943.**
37. Gomberg, M., and J. C. Pernert, J. Am. Chem Soc. **48,** 1372 **1926.**
38. Graebe, C., Ber. **25,** 3146 **1892.**
39. Graebe, C., and H. Stindt, Ann. **291,** 1 **1896.**
40. Grignard, V., and C. Courtot, Compt. rend. **152,** 1493 **1911.**
41. Hantsch, A., and W. H. Glover, Ber. **39,** 4153 **1906.**
42. Kliegl, A., Ber. **43,** 2188 **1910.**
43. Kliegl, A., Ber. **64,** 2420 **1931.**
44. Klinger, H., and C. Lonnes, Ber. **29,** 2157 **1896.**

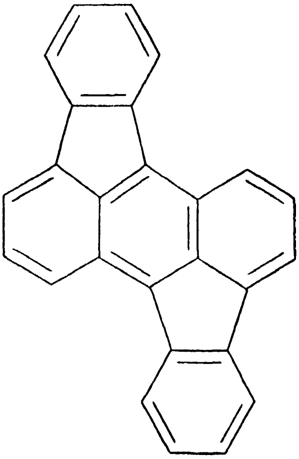
45. Koelsch, C. F., J. Am. Chem. Soc. **55**, 3394 **1933**.
46. Koelsch, C. F., J. Am. Chem. Soc. **56**, 480 **1934**.
47. Koelsch, C. F., and P. R. Johnson, J. Am. Chem. Soc. **65**, 567 **1943**.
48. Koelsch, C. F., and R. H. Rosenwald, J. Am. Chem. Soc. **59**, 2170 **1937**.
49. Koelsch, C. F., and R. V. White, J. Org. Chem. **6**, 602 **1941**.
50. Kuhn, R., and A. Winterstein, Helv. Chim. Acta **11**, 116 **1928**.
51. Lippman, E., and R. Fritsch, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **113**, Abt. IIb, 429 **1904**.
52. Luther, R., and F. Weigert, Sitzber. kgl. preuss. Akad. Wiss. **1904**, 828.
53. Manchot, W., and P. Krische, Ann. **337**, 170 **1904**.
54. Marschalk, C., Congr. chim. ind., 18th Congr., Nancy **1938**, 976; Chem. Zentr. **1939**, II, 3078.
55. Matthews, M. A., J. Chem. Soc. **1926**, 236.
56. Mikhailov, B. M., and N. G. Chernova, J. Gen. Chem. (U. S. S. R.) **12**, 288 **1942**; C. A. **37**, 3086 **1943**.
57. Nierenstein, M., and C. W. Webster, J. Am. Chem. Soc. **67**, 691 **1945**.
58. Orekhov, A., Ber. **47**, 89 **1914**.
59. Orekhov, A., J. Russ. Phys. Chem. Soc. **48**, 1702 **1916**; C. A. **11**, 3275 **1917**; Chem. Zentr. **1923**, I, 1619.
60. Orekhov, A. P., and R. Grinberg, J. Russ. Phys. Chem. Soc. **48**, 1713 **1916**; C. A. **11**, 3275 **1917**; Chem. Zentr. **1923**, I, 1619.
61. Orndorff, W. R., and F. K. Cameron, Am. Chem. J. **17**, 658 **1895**.
62. Pummerer, R., and G. Dorfmüller, Ber. **46**, 2386 **1913**.
63. Reddelien, G., Ber. **53**, 355 **1920**.
64. Ruggli, P., Ann. **414**, 125 **1917**.
65. Schlenk, W., and E. Bergmann, Ann. **463**, 1 **1928**.
66. Schmidt, J., and H. Wagner, Ber. **43**, 1796 **1910**.
67. Schoepfle, C. S., J. Am. Chem. Soc. **44**, 188 **1922**.
68. Scholl, R., and K. Meyer, Ber. **65**, 902 **1932**.
69. Schönberg, A., A. Stephenson, H. Kaltschmitt, E. Peterson, and H. Schulten, Ber. **66**, 237 **1933**.
70. Schönberg, A., and T. Stolpp, Ann. **483**, 90 **1930**.
71. Seka, R., and W. Kelleman, Ber. **75**, 1730 **1942**.
72. Smedley, I., J. Chem. Soc. **87**, 1249 **1905**.
73. Stobbe, H., and E. Färber, Ber. **57**, 1838 **1924**.
74. Stobbe, H., and F. Zschoch, Ber. **60**, 457 **1927**.
75. Stoermer, R., and G. Foerster, Ber. **52**, 1255 **1919**.
76. Suszko, J., and R. Schillak, Roczniki Chem. **14**, 1216 **1934**; C. A. **29**, 6231 **1935**; Chem. Zentr. **1935**, I, 2361.
77. Vanscheidt, A. A., J. Russ. Phys. Chem. Soc. **58**, 249 **1926**; C. A. **21**, 3616 **1927**; Chem. Zentr. **1927**, I, 92.
78. Weger, M., Z. angew. Chem. **22**, 338 **1909**.
79. Wieland, H., K. Heymann, T. Tsatsas, D. Juchum, G. Varvoglis, G. Labriola, O. Dobbelstein, and H. S. Boyd-Barrett, Ann. **514**, 145 **1934**.
80. Wieland, H., and H. Kloss, Ann. **470**, 201 **1929**.
81. Wieland, H., and E. Krause, Ann. **443**, 129 **1925**.
82. Winterstein, A., and K. Schön, Z. physiol. Chem. **230**, 146 **1934**.
83. Wislicenus, W., Ber. **48**, 617 **1915**.
84. Wittig, G., and W. Lange, Ann. **536**, 266 **1938**.
85. Wuest, H.-M., Ann. **415**, 291 **1918**.
86. Yamaguchi, S., J. Chem. Soc. Japan **9**, 303 **1934**; Chem. Zentr. **1934**, II, 4045.
87. Zal'kind, Y., and A. Kruglov, Ber. **61**, 2306 **1928**.
88. Zal'kind, Y., and A. Kruglov, J. Russ. Phys. Chem. Soc. **61**, 803 **1929**; C. A. **23**, 4678 **1929**.
89. Zinke, A., and O. Benndorf, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **143**, Abt. IIb, 1 **1934**.

XVII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-38}

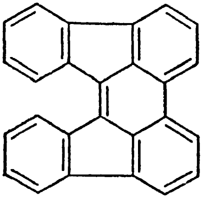
XVII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-38}

$C_{26}H_{14}$

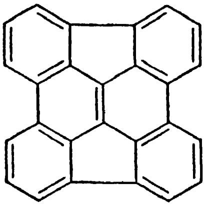
Diindo-[3,2,1-de,3′,2′,1′-kl]-anthracene
(Rubicene)



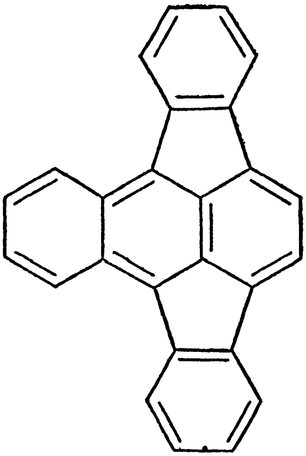
M. P., °C
306[31]
306 (a)[36, 37]
306 (b)[26]
305 (b)[27]

(a) The structural formula of this compound was given in the literature as  , but later work proved the above formula to be correct for rubicene.

(b) This compound is given the formula $C_{26}H_{12}$ in the literature. The structural formula is given as follows:



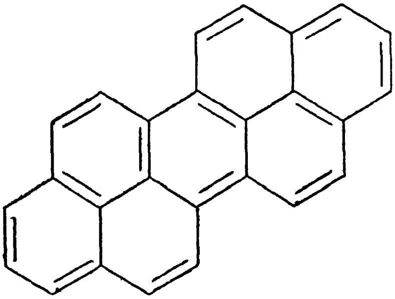
Diindo-[3,2,1-de,3′,2′,1′-mn]-anthracene
(Isorubicene)



M. P., °C
335 (a)[18]

(a) This compound sinters at 330.

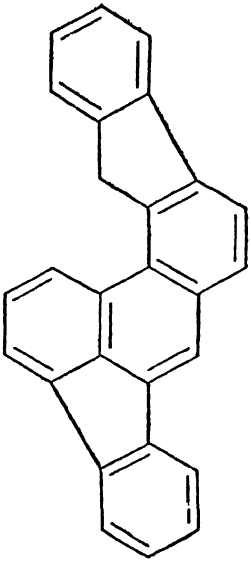
Dibenzo-[cd,lm]-perylene
(Peropyrene)



M. P., °C
374–375[20]

$C_{27}H_{16}$

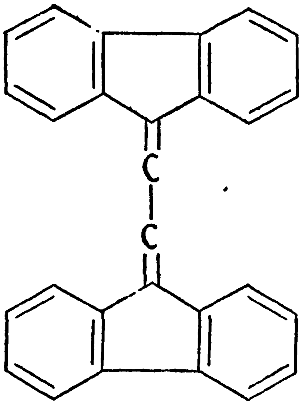
Diindo-[3,2-c,1′,2′,3′-jk]-phenanthrene



M. P., °C
198–199[44]

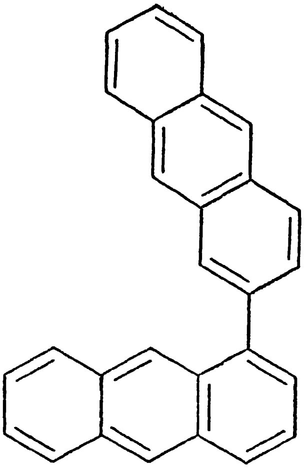
$C_{28}H_{18}$

1,2-Di-(9′-fluorylidene)-ethane



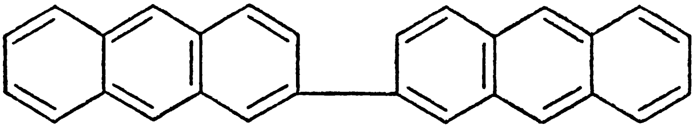
M. P., °C
372–374[45]
360[43]

1,2′-Bianthryl



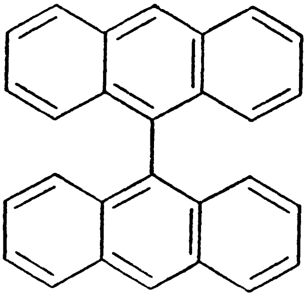
Additional Data
Sublimation Temp. (°C)
330[10]

2,2′-Bianthryl



M. P., °C
355–355.5[39]

9,9′-Bianthryl



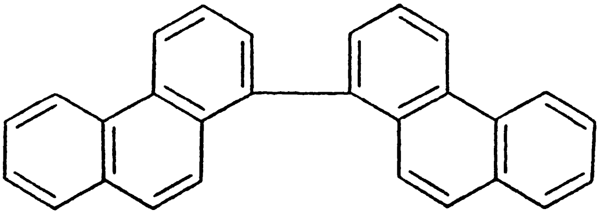
M. P., °C
319–320[25]
308–310[16, 19]
304[38]
300–302[8]
300[28, 32, 35, 40]

Isodianthryl (a)

M. P., °C
312[5]

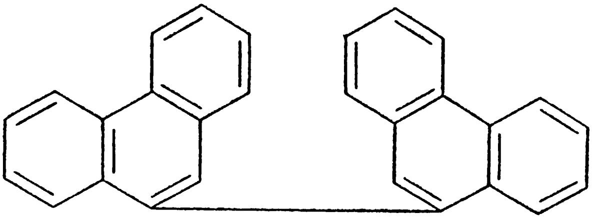
(a) The structure of this compound was not clearly defined in the literature.

1,1′-Biphenanthryl



M. P., °C
224–226[30]

9,9′-Biphenanthryl



M. P., °C
188–189[46]
184–185[3]

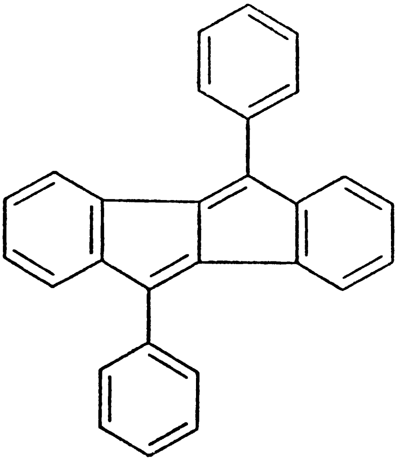
---

x, x′-Biphenanthryl (a)

M. P., °C
308[34]

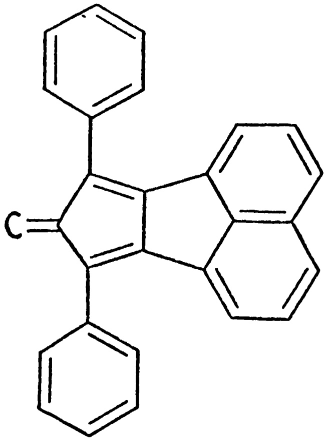
(a) The structure of this compound was not clearly defined in the literature.

3,4,7,8-Dibenzo-2,6-diphenylbicyclo-[3,3,0]-octadiene-1,5



M. P., °C
259–260[11]
259[13]

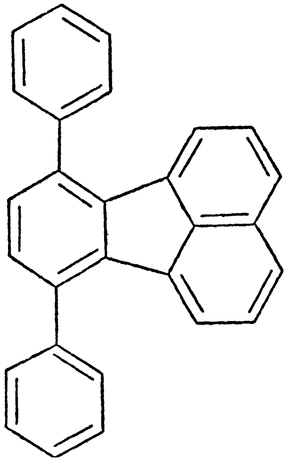
1,4-Diphenyl-2,3-(2′,1′-acenaphtho)-5-methylenecyclopentadiene-1,3



M. P., °C
225–226[23]

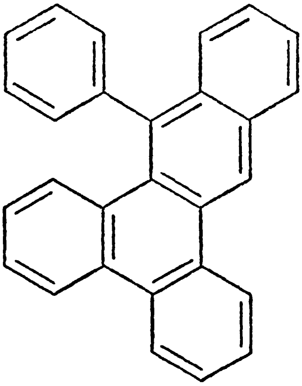
This series continued on next page

1,4-Diphenyl-2,3-(2′,1′-acenaphtho)-benzene



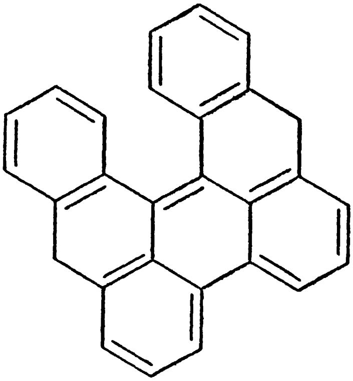
M. P., °C
162–163[22]
160–161[1]

2,3-Benzo-1-phenyltriphenylene



M. P., °C
227[6, 9]

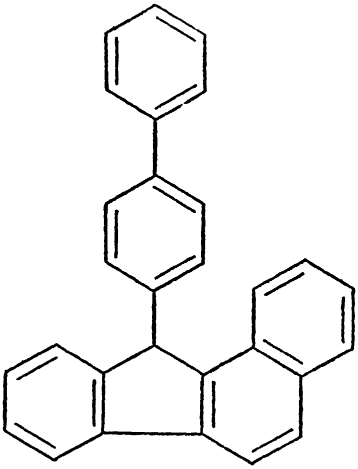
1,2,11,12-Dibenzo-3,10-dihydroperylene



M. P., °C
269–270[17]

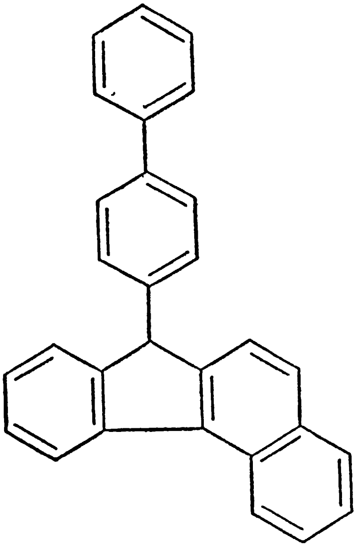
$C_{29}H_{20}$

1,2-Benzo-9-*p*-biphenylylfluorene



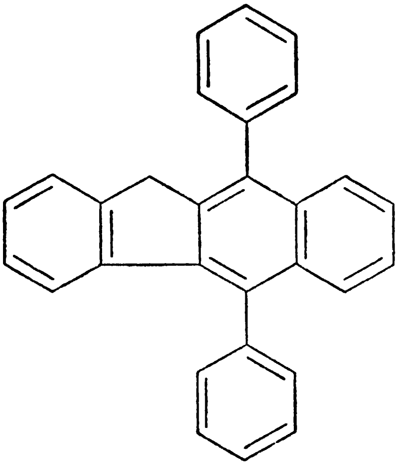
M. P., °C
276[28A]

3,4-Benzo-9-*p*-biphenylylfluorene



M. P., °C
275–276[21]

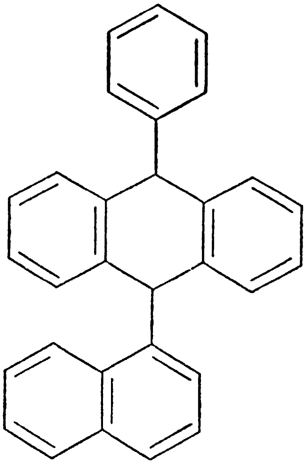
2,3-Benzo-1,4-diphenylfluorene



M. P., °C
199[42]

$C_{30}H_{22}$

9-Phenyl-10-(1′-naphthyl)-9,10-dihydroanthracene



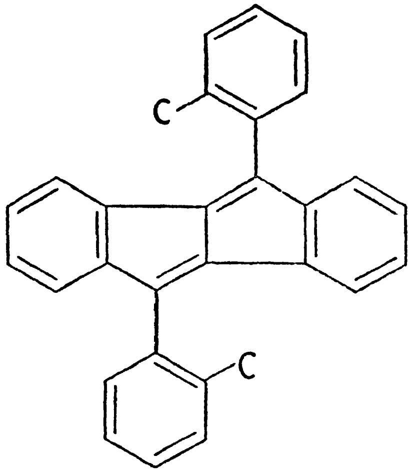
M. P., °C
225[29]

---

x,x-(x′,x″-Diphenanthryl)-ethane
(a)
M. P., °C
252.5–254.5[41]

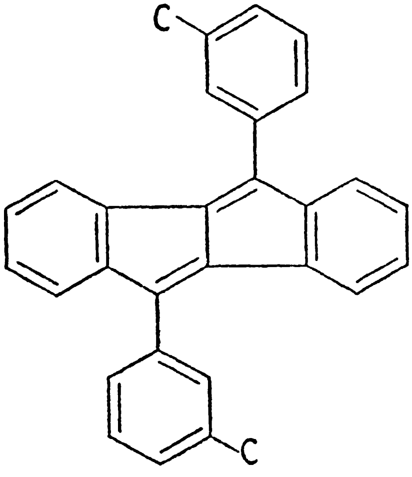
(a) The structure of this compound was not clearly defined in the literature.

3,4,7,8-Dibenzo-2,6-di-*o*-tolylbicyclo-[3,3,0]-octadiene-1,5



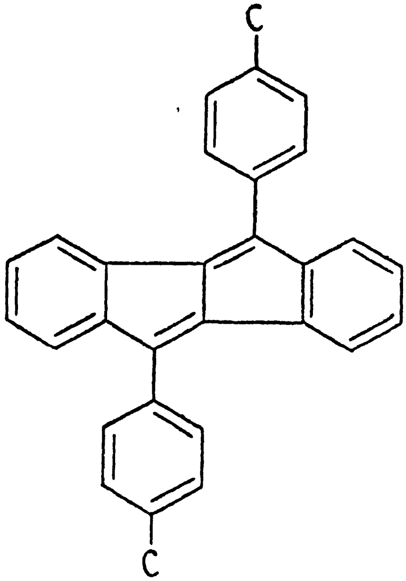
M. P., °C
240[12]

3,4,7,8-Dibenzo-2,6-di-*m*-tolylbicyclo-[3,3,0]-octadiene-1,5



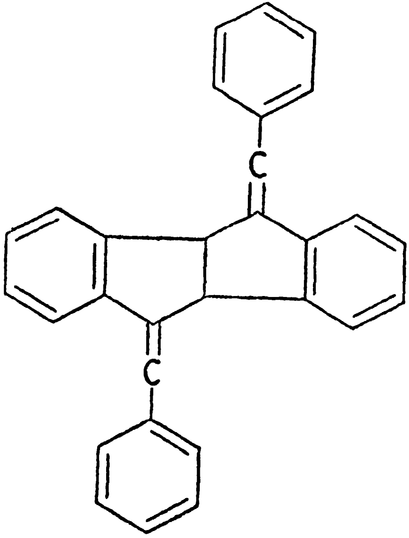
M. P., °C
184–185[12]
184[13]

3,4,7,8-Dibenzo-2,6-di-*p*-tolylbicyclo-[3,3,0]-octadiene-1,5



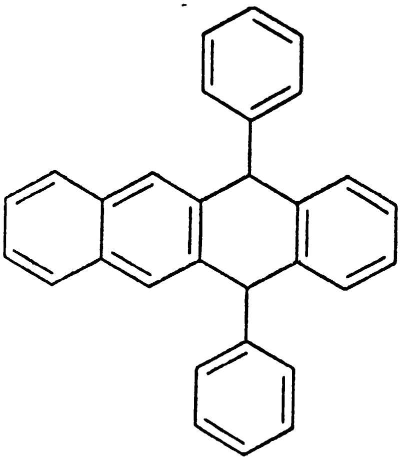
M. P., °C
271–272[11]
271[13]

3,4,7,8-Dibenzo-2,6-dibenzylidenebicyclo-[3,3,0]-octane



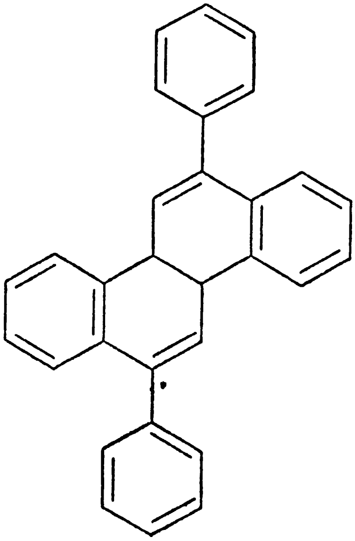
M. P., °C
255[14, 15]

5,12-Diphenyl-5,12-dihydronaphthacene



M. P., °C
206–207[21]

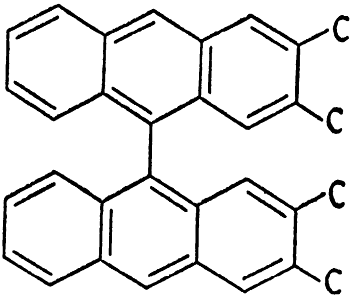
6,12-Diphenyl-4b,10b-dihydrochrysene



M. P., °C
265–266[23]

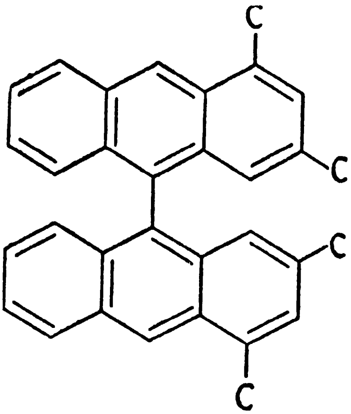
$C_{32}H_{26}$

9,9′-Bi-2,3-dimethylanthryl



M. P., °C
310[4]

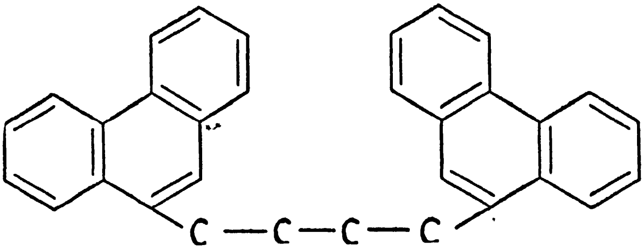
10,10′-Bi-1,3-dimethylanthryl



M. P., °C
284[4]

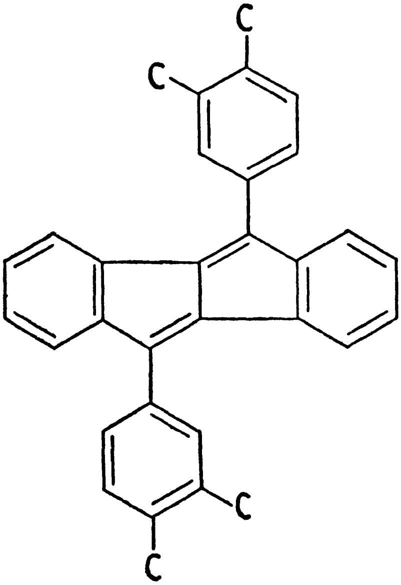
This series continued on next page

1,4-Di-(9′-phenanthryl)-butane



M. P., °C
214–216[7]

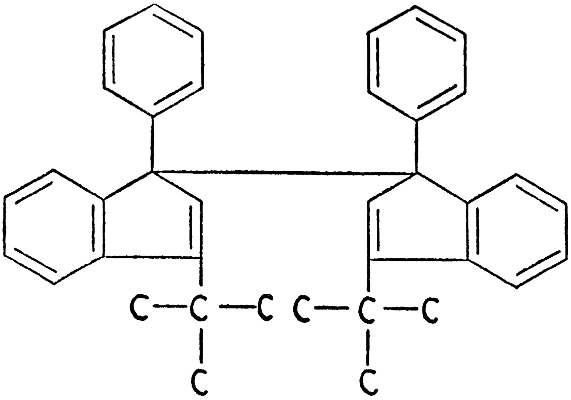
3,4,7,8-Dibenzo-2,6-di-(3′,4′-dimethylphenylbicyclo-[3,3,0]-octadiene-1,5



M. P., °C
212[12]

This series continued on next page

$C_{38}H_{38}$
1,1′-Bi-(1-phenyl-3-*tert*-butylindenyl)



M. P., °C
150–151[2]

References on Polynuclear Aromatics of Empirical Formula C_nH_{2n-38}

1. Abramov, V. S., and N. P. Tsyplenkova, Bull. acad. sci. U. R. S. S. **1944,** 60; Survey For. Petrol. Liter. Jan. 26, **1945.**
2. Althausen, D., and C. S. Marvel, J. Am. Chem. Soc. **54,** 1174 **1932.**
3. Bachmann, W. E., J. Am. Chem. Soc. **56,** 1363 **1934.**
4. Barnett, E. de B., Ber. **65,** 1563 **1932.**
5. Barnett, E. de B., and N. F. Goodway, J. Chem. Soc. **1929,** 813.
6. Bergmann, E., and T. Berlin, J. Chem. Soc. **1939,** 493.
7. Bergmann, E., and O. Blum-Bergmann, J. Am. Chem. Soc. **58,** 1678 **1936.**
8. Bergmann, E., and W. Schuchardt, Ann. **487,** 225 **1931.**
9. Bergmann, E., and O. Zwecker, Ann. **487,** 155 **1931.**
10. Berton, A., Compt. rend. **208,** 1898 **1939.**
11. Brand, K., Ber. **45,** 3071 **1912.**
12. Brand, K., H. Ludwig, and L. W. Berlin, J. prakt. Chem. [2] **110,** 26 **1925.**
13. Brand, K., and W. Muhl, J. prakt. Chem. [2] **110,** 1 **1925.**
14. Brand, K., and K. O. Müller, Ber. **55,** 601 **1922.**
15. Brand, K., and F. Schläger, Ber. **56,** 2541 **1923.**
16. Brass, K., and K. Fanta, Ber. **69,** 1 **1936.**
17. Clar, E., "Aromatische Kohlenwasserstoffe," Springer-Verlag, Berlin, **1941,** p. 235.
18. Clar, E., Ber. **64,** 2194 **1931.**
19. Clar, E., Ber. **65,** 503 **1932.**
20. Clar, E., Ber. **76,** 458 **1943.**
21. Dilthey, W., J. prakt. Chem. [2] **109,** 273 **1925.**
22. Dilthey, W., S. Henkels, and A. Schaefer, Ber. **71,** 974 **1938.**
23. Dilthey, W., and P. Huchtemann, J. prakt. Chem. [2] **154,** 238 **1940.**
24. Dufraisse, C., and R. Horclois, Bull. soc. chim. [5] **3,** 1894 **1936.**
25. Dufraisse, C., L. Velluz, and Mme. L. Velluz, Bull. soc. chim. [5] **5,** 600 **1938.**
26. Dziewoński, K., and J. Suszko, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1921A,** 67.
27. Dziewoński, K., and J. Suszko, Roczniki Chem. **1,** 387 **1921;** C.A. **17,** 1459 **1921.**
28. Eckert, A., and A. Hofmann, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **124,** Abt. IIb, 125 **1915.**
28A. Gomberg, M., and W. E. Gordon, J. Am. Chem. Soc. **57,** 119 **1935.**
29. Guyot, A., and C. Stachling, Bull. soc. chim. [3] **33,** 1105 **1905.**
30. Ioffe, I. S., J. Gen. Chem. (U.S.S.R.) **3,** 524 **1933;** Chem. Zentr. **1935, I,** 391.

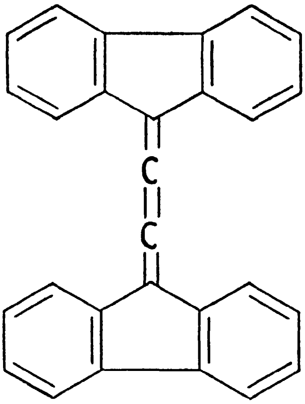
31. Khmelevskiĭ, V. I., and I. Y. Postovskiĭ, J. Gen. Chem. (U.S.S.R.) **9,** 620 **1939;** C.A. **33,** 7777 **1939.**
32. Liebermann, C., and A. Gimbel, Ber. **20,** 1854 **1887.**
33. Marvel, C. S., and W. J. Peppel, J. Am. Chem. Soc. **61,** 895 **1939.**
34. Meyer, H., and A. Hoffmann, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **125–126,** Abt. IIb, 449 **1916–1917.**
35. Minaev, W., and B. Fedorov, Ber. **62,** 2489 **1929.**
36. Pummerer, R., Ber. **45,** 294 **1912.**
37. Pummerer, R., and H. M. Ulrich, Ber. **58,** 1806 **1925.**
38. Schlenk, W., and E. Bergmann, Ann. **463,** 1 **1928.**
39. Scholl, R., Ber. **52,** 1829 **1919.**
40. Schulze, K. E., Ber. **18,** 3034 **1885.**
41. Tarbell, D. S., and V. P. Wystrach, J. Am. Chem. Soc. **65,** 2149 **1943.**
42. Weiss, R., and A. Beller, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **141,** Abt. IIb, 511 **1932.**
43. Wieland, H., and E. Krause, Ann. **443,** 129 **1925.**
44. Wieland, H., and O. Probst, Ann. **530,** 274 **1937.**
45. Wislicenus, W., Ber. **48,** 617 **1915.**
46. Zinke, A., and E. Ziegler, Ber. **74,** 115 **1941.**

XVIII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-40}

XVIII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-40}

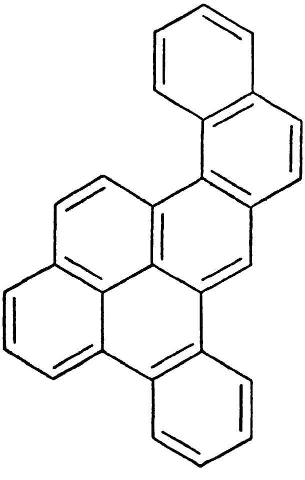
$C_{28}H_{16}$

1,2-Di-(9′-fluorylidene)-ethene



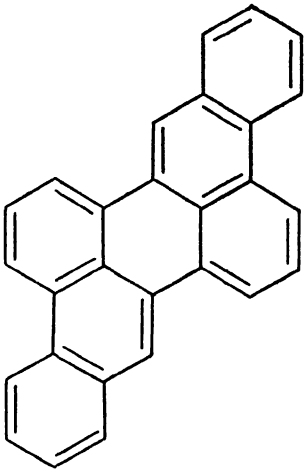
M. P., °C
330[32]

1,2-(4′,3′-Naphtho)-4,5-benzopyrene



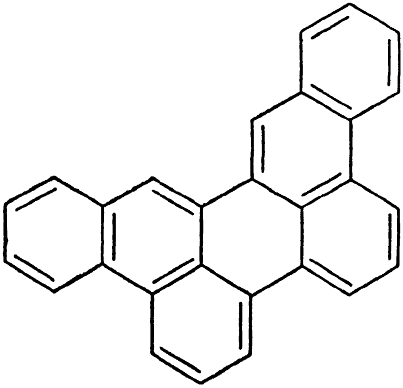
M. P., °C
242–244[24]

2,3,8,9-Dibenzoperylene



M. P., °C
310–343[26, 27]
299–300[39]

2,3,10,11-Dibenzoperylene

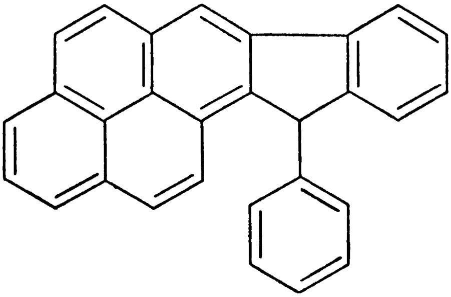


M. P., °C
343–345 (a)[39]
343 (a) [9, 14]
315–318 (a)[26, 27]

(a) Clar ("Aromatische Kohlenwasserstoffe," Springer-Verlag, Berlin, 1941, p. 236) indicates that these are three different compounds, but does not assign a definite structure to the compound in references 26, 27, and 39.

$C_{29}H_{18}$

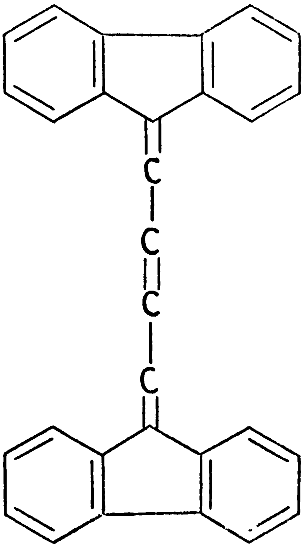
2,3-[3′,2′-(1′-Phenylindo)]-pyrene



M. P., °C
279–280[15]

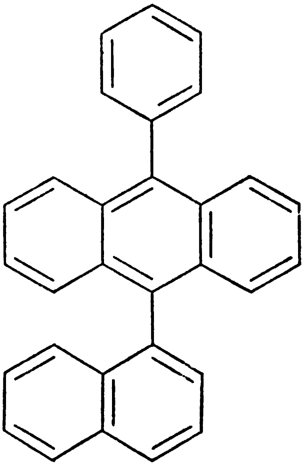
$C_{30}H_{20}$

1,4-Di-(9′-fluorylidene)-butene-2



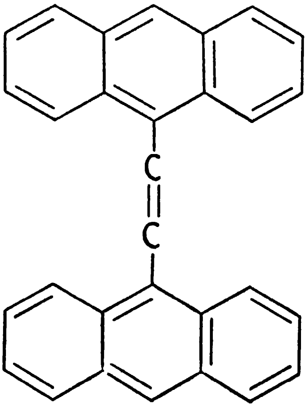
M. P., °C
340[34]
331–332[33]

9-Phenyl-10-(1′-naphthyl)-anthracene



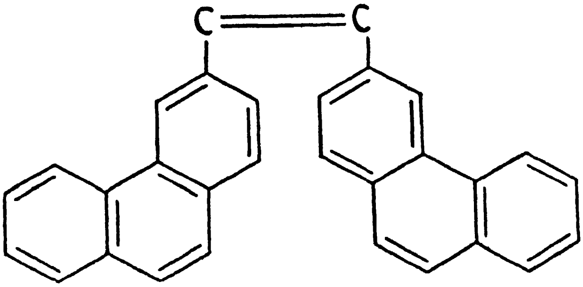
M. P., °C
244–245[4]
229[25]

1,2-Di-(9′-anthryl)-ethene



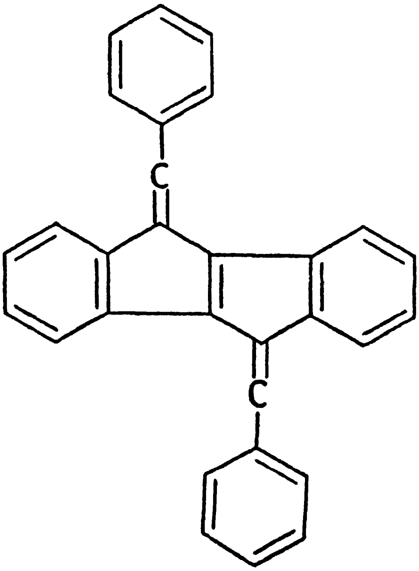
M. P., °C
337[38]

1,2-Di-(3′-phenanthryl)-ethene



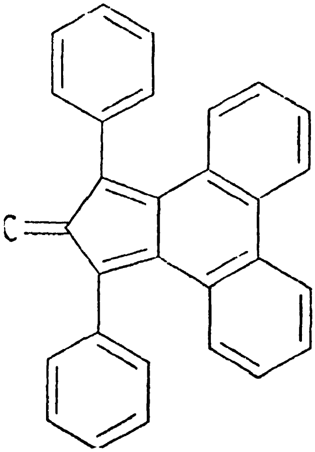
M. P., °C
289[33]

2,3,6,7-Dibenzo-4,8-dibenzylidene-bicyclo-[3,3,0]-octene-1,5



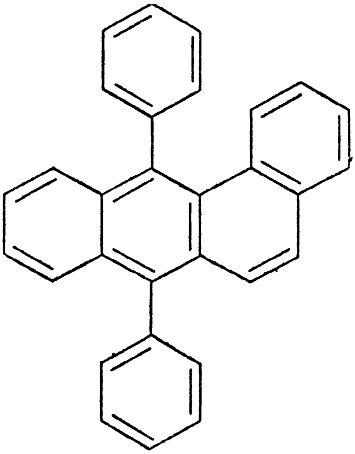
M. P., °C
244[8]

2,3-(9′,10′-Phenanthro)-1,4-diphenyl-5-methylenecyclopentadiene-1,3



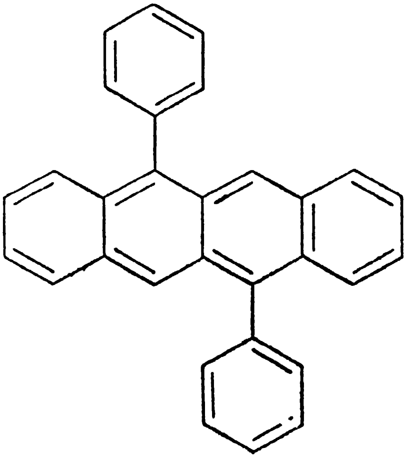
M. P., °C
239–240[15]

1,2-Benzo-9,10-diphenylanthracene



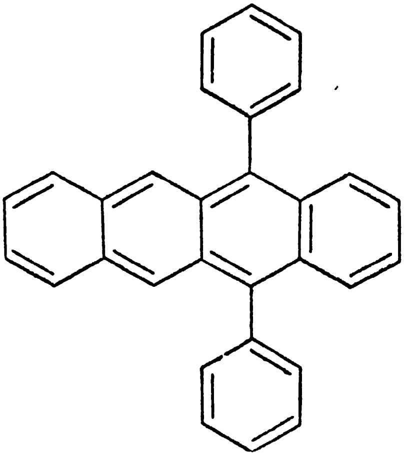
M. P., °C
192[13]

5,11-Diphenylnaphthacene
(Diphenylrubene)



M. P., °C
301–302[21]

5,12-Diphenylnaphthacene



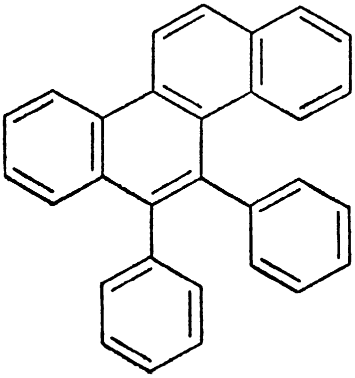
M. P., °C
207–208[20]

x,x-Diphenylnaphthacene (a)

M. P., °C
258[22]

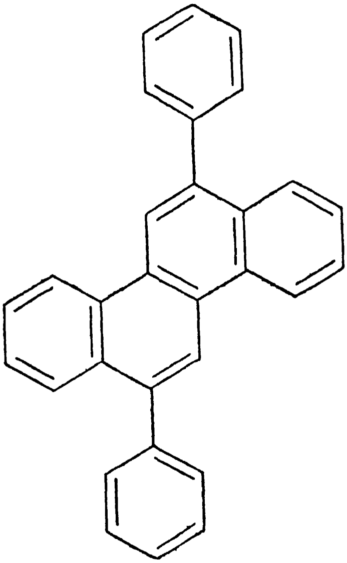
(a) The structure of this compound was not clearly defined in the literature.

5,6-Diphenylchrysene



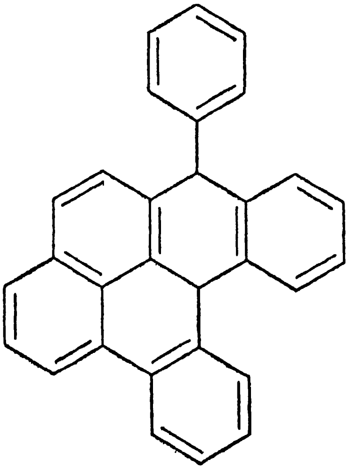
M. P., °C
208–209[17]

6,12-Diphenylchrysene



M. P., °C
285[35]

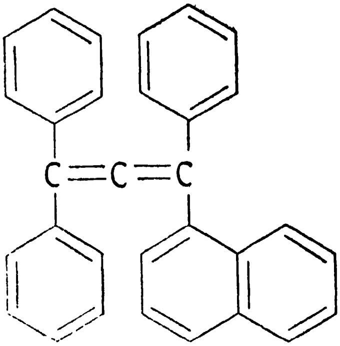
2,3,4,5-Dibenzo-1-phenyl-1,3a-dihydropyrene



M. P., °C
257–258[13]

$C_{31}H_{22}$

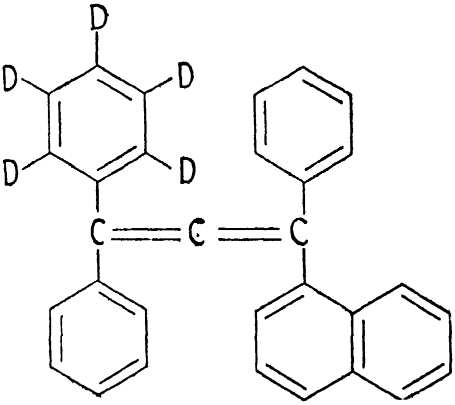
1,1,3-Triphenyl-3-(1′-naphthyl)-propadiene



M. P., °C
142 (a)[16]
100–102 (a)[16]

(a) These constants were determined on different crystalline forms.

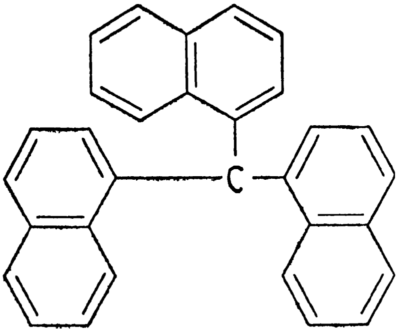
1,3-Diphenyl-1-pentadeuterophenyl-3-(1′-naphthyl)-propadiene



M. P., °C
142 (a)[16]
100-101 (a)[16]

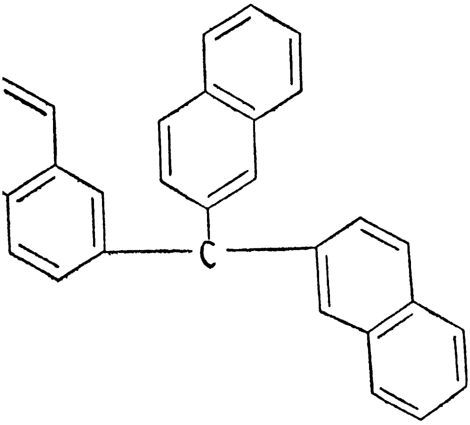
(a) These constants were determined on different crystalline forms.

Tri-(1-naphthyl)-methane



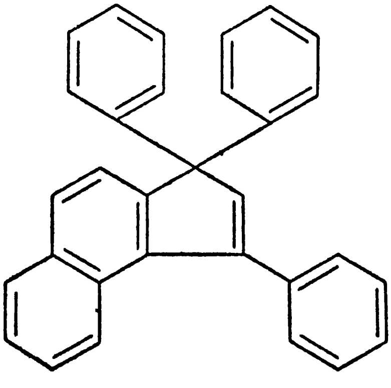
M. P., °C
191[11]

Tri-(2-naphthyl)-methane



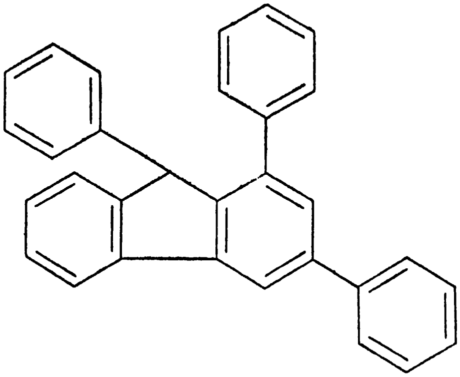
M. P., °C
178–179[12]

4,5-Benzo-1,1,3-triphenylindene



M. P., °C
234[16]

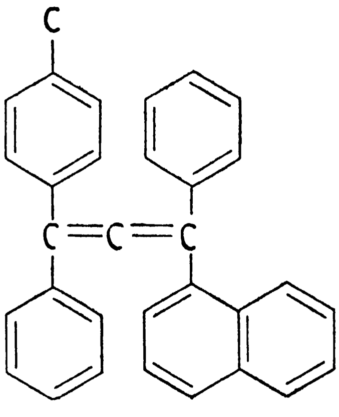
1,3,9-Triphenylfluorene



M. P., °C
149[31]

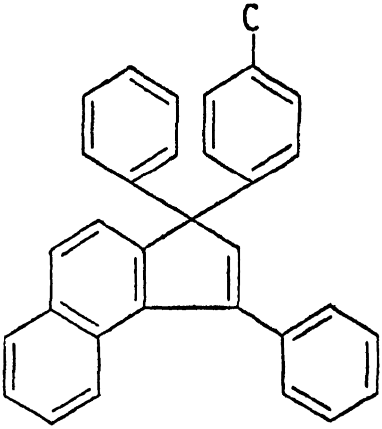
$C_{32}H_{24}$

1,3-Diphenyl-1-*p*-tolyl-3-(1′-naphthyl)-propadiene



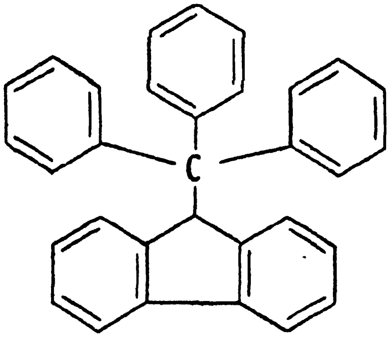
M. P., °C
119–120[16]

4,5-Benzo-1,3-diphenyl-1-*p*-tolylindene



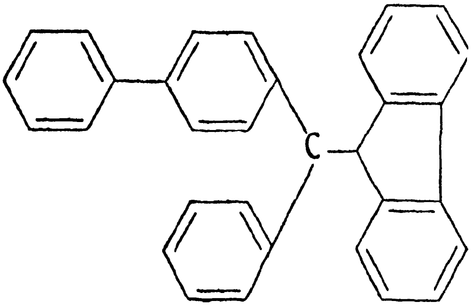
M. P., °C
172–175[16]

(9-Fluoryl)-triphenylmethane



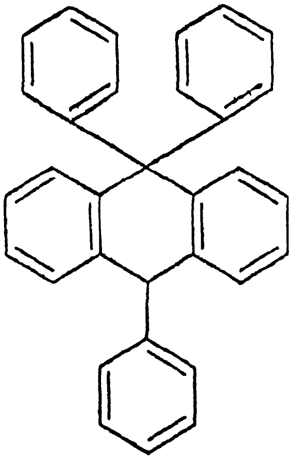
M. P., °C
258–260[28]
248–256 (in nitrogen)[2]
234–235[2]

Phenyl-*p*-biphenylyl-(9′-fluoryl)-methane



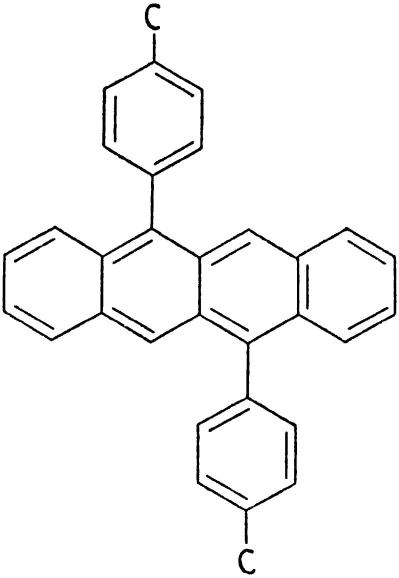
M. P., °C
253–254[6]

9,9,10-Triphenyl-9,10-dihydroanthracene



M. P., °C
230[3]
226–227[37]
223–225[29]

5,11-Di-*p*-tolylnaphthacene



M. P., °C
335–336[36]

---

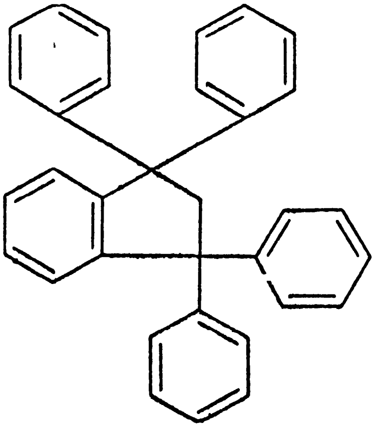
x,x-Dibenzylchrysene (a)

M. P., °C
254[23]

(a) The structure of this compound was not clearly defined in the literature.

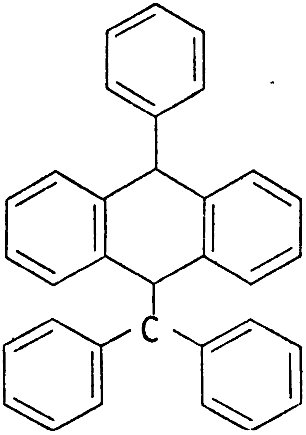
$C_{33}H_{26}$

1,1,3,3-Tetraphenylindane



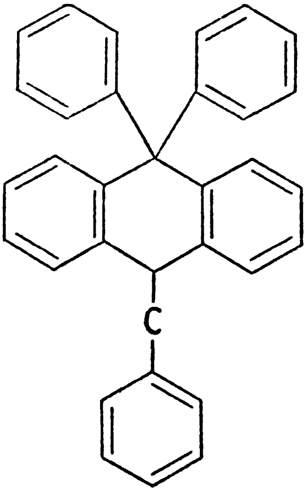
M. P., °C
191–192[30]

9-Phenyl-10-benzhydryl-9,10-dihydroanthracene



M. P., °C
217[5]

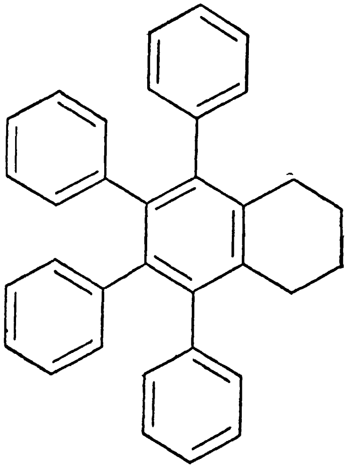
9,9-Diphenyl-10-benzyl-9,10-dihydroanthracene



M. P., °C
192[7]

$C_{34}H_{28}$

5,6,7,8-Tetraphenyl-1,2,3,4-tetrahydronaphthalene



M. P., °C
271–272[19]

---

x,x-Diphenyl-x_6-hexahydropentacene (a)

M. P., °C
252[1]

(a) The structure of this compound was not clearly defined in the literature, but the phenyl groups are probably in the 6- and 13-positions.

$C_{36}H_{32}$

Tetraindene (a)

M. P., °C
109–110[10]

(a) The structure of this compound was not clearly defined in the literature.

References on Polynuclear Aromatics of Empirical Formula C_nH_{2n-40}

1. Allen, C. F. H., and A. Bell, J. Am. Chem. Soc. **64,** 1253 **1942.**
2. Bachmann, W. E., J. Am. Chem. Soc. **55,** 2135 **1939.**
3. Barnett, E. de B., J. W. Cook, and I. G. Nixon, J. Chem. Soc. **1927,** 501.
4. Barnett, E. de B., J. W. Cook, and J. L. Wiltshire, J. Chem. Soc. **1927,** 1724.
5. Bergmann, E., Ber. **63,** 1037 **1930.**
6. Bergmann, E., Ber. **63,** 1617 **1930.**
7. Bergmann, E., and S. Fujise, Ann. **480,** 188 **1930.**
8. Brand, K., and K. O. Müller, Ber. **55,** 601 **1922.**
9. Brass, K., and K. Fanta, Ber. **69,** 1 **1936.**
10. Bruson, H. A., Ber. **60,** 1094 **1927.**
11. Chichibabin, A. E., Ber. **44,** 1105 **1911.**
12. Chichibabin, A. E., and S. I. Koryagin, J. prakt. Chem. [2] **88,** 505 **1913.**
13. Clar, E., Ber. **63,** 112 **1930.**
14. Clar, E., Ber. **65,** 846 **1932.**
15. Clar, E., Ber. **69,** 1671 **1936.**
16. Clemo, G. R., R. Raper, and A. C. Robson, J. Chem. Soc. **1939,** 431.
17. Cook, J. W., and R. A. E. Galley, J. Chem. Soc. **1931,** 2012.
18. Dilthey, W., and P. Huchtemann, J. prakt. Chem. [2] **154,** 238 **1940.**
19. Dilthey, W., W. Schommer, W. Hoschen, and H. Dietrichs, Ber. **68,** 1159 **1935.**
20. Dufraisse, C., and R. Horclois, Bull. soc. chim. [5] **3,** 1894 **1936.**
21. Dufraisse, C., and M. Loury, Compt. rend. **200,** 1673 **1935.**
22. Enderlin, L., Compt. rend. **203,** 192 **1936.**
23. Funke, K., E. Müller, and L. Vadasz, J. prakt. Chem. [2] **144,** 265 **1936.**
24. Grechkin, N. P., and A. E. Arbusov, Compt. rend. acad. sci. U.R.S.S. **32,** 50 **1941;** Survey For. Petrol. Liter. No. 342, Jan. 16, **1942.**
25. Guyot, A., and C. Staehling, Bull. soc. chim. [3] **33,** 1105 **1905.**
26. Ioffe, I. S., J. Gen. Chem. (U.S.S.R.) **3,** 524 **1933;** Chem. Zentr. **1935, I,** 391.
27. Ioffe, I., Trudy Leningrad. Khim. Tekh. Inst. No. 1, 61 **1934;** C.A. **29,** 7969 **1935.**

28. Koelsch, C. F., J. Am. Chem. Soc. **55,** 3394 **1933.**

29. Koelsch, C. F., J. Org. Chem. **3,** 456 **1938.**

30. Koelsch, C. F., and R. H. Rosenwald, J. Am. Chem. Soc. **59,** 2170 **1937.**

31. Kohler, E. P., and L. W. Blanchard, J. Am. Chem. Soc. **57,** 367 **1935.**

32. Kuhn, R., and G. Platzer, Ber. **73,** 1410 **1940.**

33. Kuhn, R., and K. Wallenfels, Ber. **71,** 1889 **1938.**

34. Kuhn, R., and A. Winterstein, Helv. Chim. Acta **11,** 116 **1928.**

35. Marvel, C. S., and W. J. Peppel, J. Am. Chem. Soc. **61,** 895 **1939.**

36. Weizmann, A., J. Org. Chem. **8,** 285 **1943.**

37. Wittig, G., and M. Leo, Ber. **64,** 2395 **1931.**

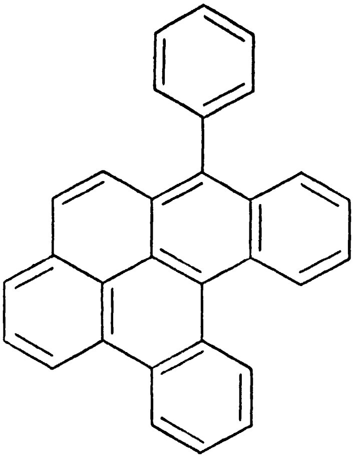
38. Wood, J. H., J. A. Bacon, A. W. Meibohm, W. H. Throckmorton, and G. P. Turner, J. Am. Chem. Soc. **63,** 1334 **1941.**

39. Zinke, A., and E. Ziegler, Ber. **74,** 115 **1941.**

XIX. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-42}

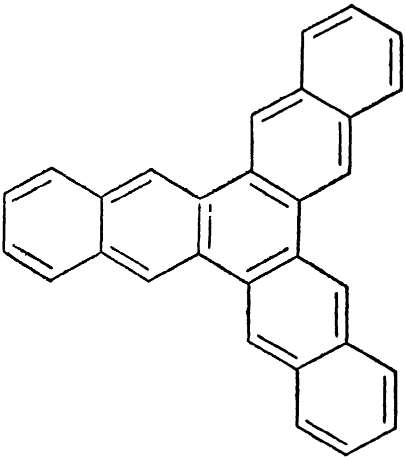
$C_{30}H_{18}$

2,3,4,5-Dibenzo-1-phenylpyrene



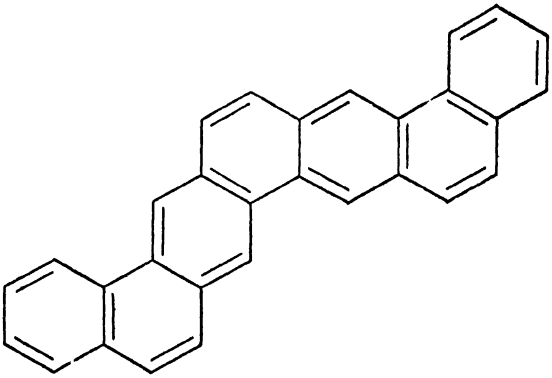
M. P., °C
242–243[11]

1,2,3,4-Di-(3′,2′-naphtho)-anthracene



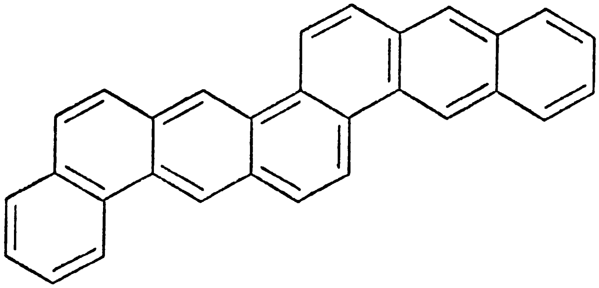
M. P., °C
392[19]
390[19]
388[19]
387[19]

1,2-Benzo-5,6-(2′,3′-phenanthro)-anthracene



M. P., °C
398–399[14]

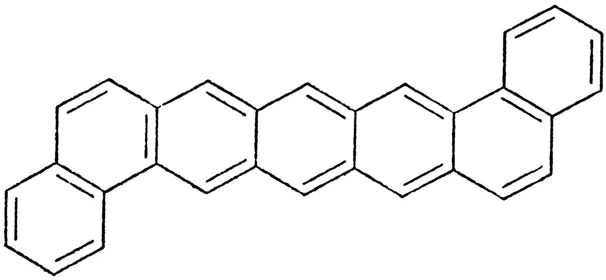
2,3-Benzo-8,9-(4′,3′-naphtho)-chrysene



M. P., °C 435–440 (a)[16]

(a) This compound melts with decomposition.

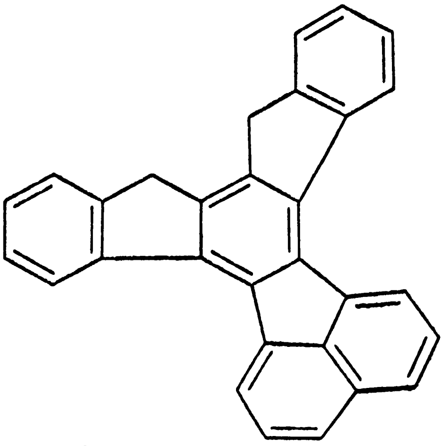
1,2,8,9-Dibenzopentacene



M. P., °C 410 (a)[18]

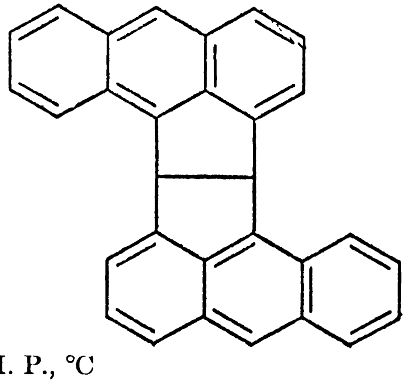
(a) This compound melts with decomposition.

1,2-(2′,3′-Indo)-3,4-(2′,1′-acenaphtho)-fluorene



M. P., °C
299[17]

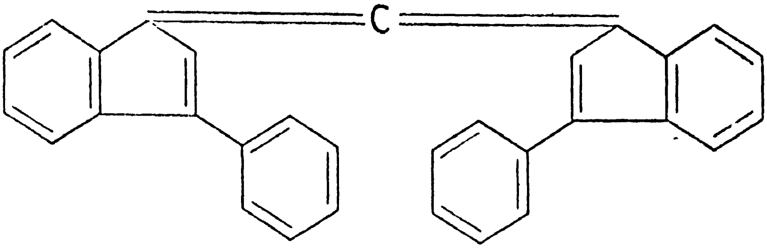
1,2-[2′,1′-(3,4′-Benzoacenaphtheno)]-3,4-benzoacenaphthene



M. P., °C
349[12]

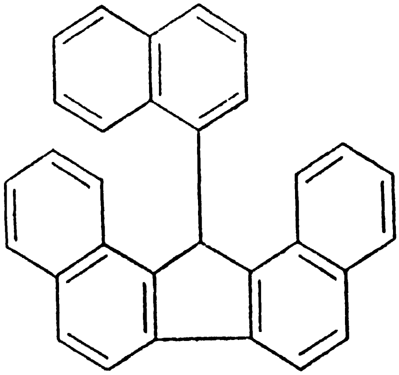
$C_{31}H_{20}$

Di-(3-phenylindenylidene)-methane



M. P., °C
205–206[7]

1,2,7,8-Dibenzo-9-(1′-naphthyl)-fluorene



M. P., °C
191[8, 9]

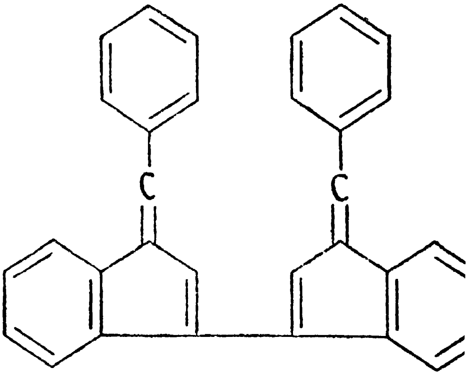
2,3,6,7-Dibenzo-x-(2′-naphthyl)-fluorene (a)

M. P., °C
235–237 (in carbon dioxide)[10]

(a) The structure of this compound was not clearly defined in the literature.

$C_{32}H_{22}$

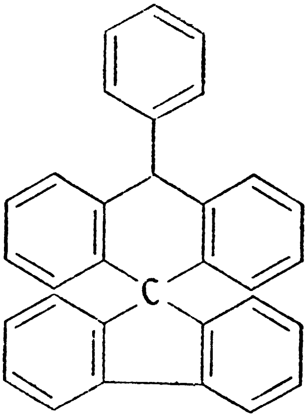
Bi-3,3′-(1-Benzylideneindenyl)



M. P., °C
217.5[21]

This series continued on next page

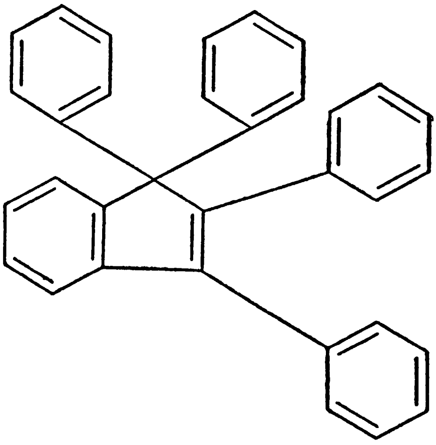
Spiro[9-phenyl-9,10-dihydroanthracene-10,9′-fluorene]



M. P., °C
267–268[15]

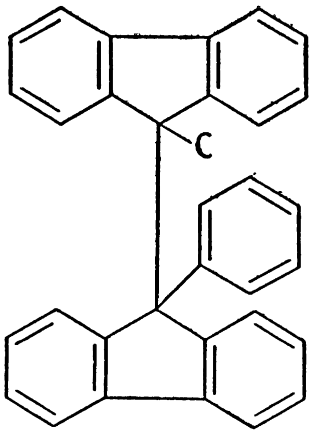
$C_{33}H_{24}$

1,1,2,3-Tetraphenylindene



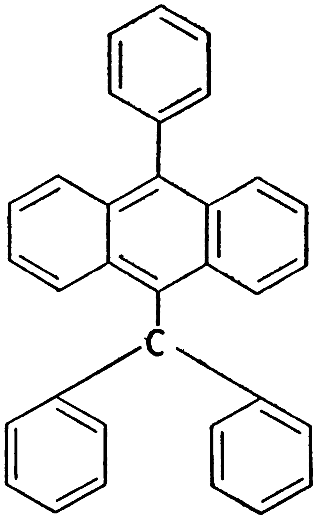
M. P., °C
149–150[18]

9-Phenyl-9′-methyl-9,9′-bifluorenyl



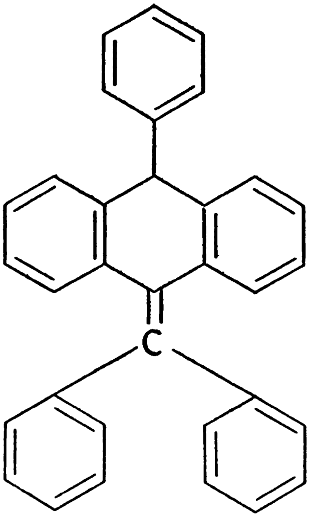
M. P., °C
161[22]

9-Phenyl-10-benzhydrylanthracene



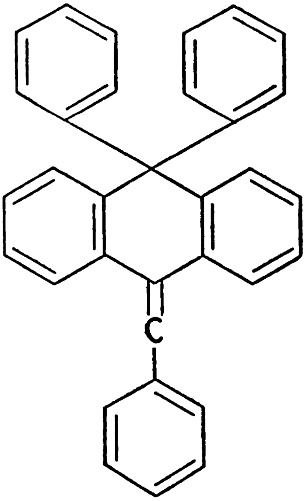
M. P., °C
154–155[4]

9-Phenyl-10-benzhydrylidene-9,10-dihydroanthracene



M. P., °C
218[4]

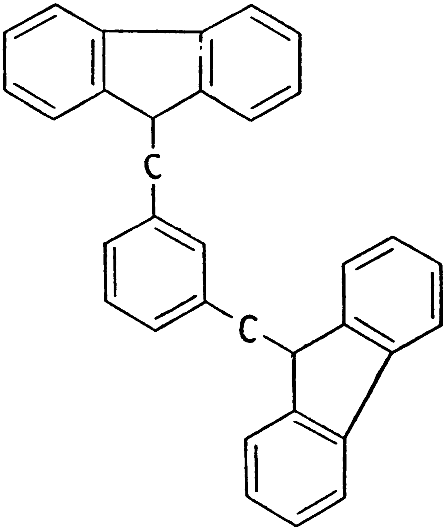
9,9-Diphenyl-10-benzylidene-9,10-dihydroanthracene



M. P., °C
254–255[2]
249[6]

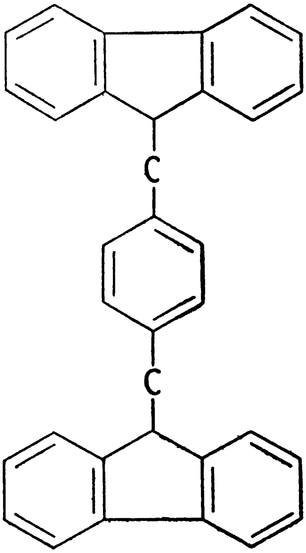
$C_{34}H_{26}$

1,3-Di-(9′-fluorylmethyl)-benzene



M. P., °C
119–120[20]

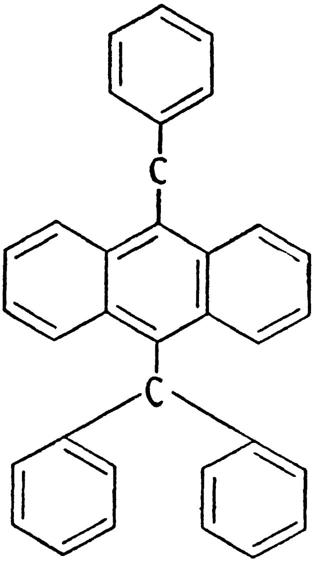
1,4-Di-(9′-fluorylmethyl)-benzene



M. P., °C
239–240[20]

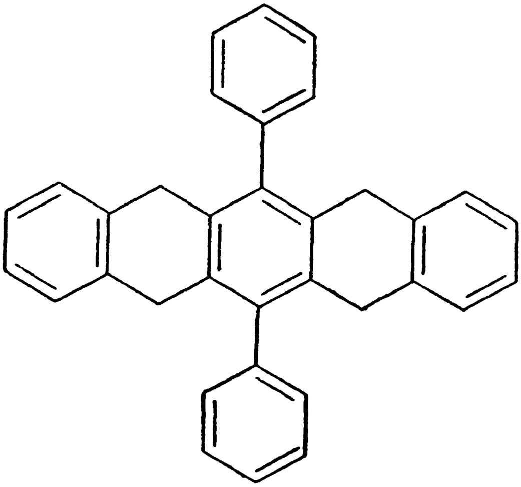
9-Benzyl-10-benzhydrylanthracene

This series continued on next page



M. P., °C
236[3]

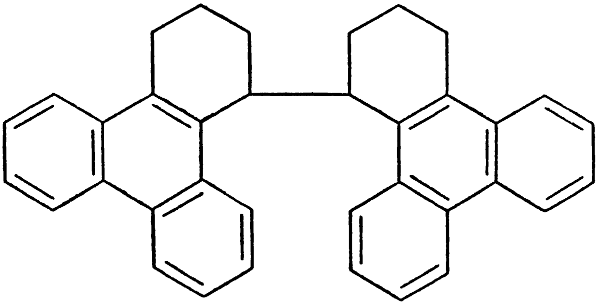
6,13-Diphenyl-5,7,12,14-tetrahydropentacene



M. P., °C
329–331[1]

$C_{36}H_{30}$

4,4'-Bi-(1,2,3,4-tetrahydrotriphenylenyl)



M. P., °C
300[5]

References on Polynuclear Aromatics of Empirical Formula C_nH_{2n-42}

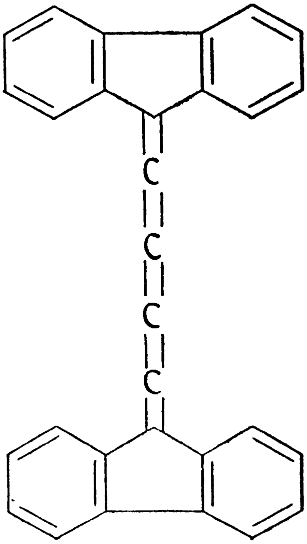
1. Allen, C. F. H., and A. Bell, J. Am. Chem. Soc. **64**, 1253 **1942.**
2. Barnett, E. de B., and J. W. Cook, J. Chem. Soc. **1928,** 566.
3. Barnett, E. de B., and N. F. Goodway, J. Chem. Soc. **1929,** 1754.
4. Bergmann, E., Ber. **63,** 1037 **1930.**
5. Bergmann, E., and O. Blum-Bergmann, J. Am. Chem. Soc. **59,** 1441 **1937.**
6. Bergmann, E., and S. Fujise, Ann. **480,** 188 **1930.**
7. Blum-Bergmann, O., Ann. **492,** 277 **1932.**
8. Chichibabin, A. E., J. prakt. Chem. [2] **84,** 760 **1911.**
9. Chichibabin, A. E., J. Russ. Phys. Chem. Soc. **43,** 1022 **1911;** Chem. Zentr. **1911,** II, 1929.
10. Chichibabin, A. E., and S. I. Koryagin, J. prakt. Chem. [2] **88,** 505 **1913.**
11. Clar, E., Ber. **63,** 112 **1930.**
12. Clar, E., Ber. **72,** 2134 **1939.**
13. Clar, E., Ber. **76,** 257 **1943.**
14. Clar, E., F. John, and R. Avenarius, Ber. **72,** 2139 **1939.**
15. Clarkson, R. G., and M. Gomberg, J. Am. Chem. Soc. **52,** 2881 **1930.**
16. Cook, J. W., J. Chem. Soc. **1931,** 499.
17. Dilthey, W., and S. Henkels, J. prakt. Chem. [2] **149,** 85 **1937.**
18. Koelsch, C. F., J. Am. Chem. Soc. **54,** 3384 **1932.**
19. Pummerer, R., A. Lüttringhaus, R. Fick, S. Pfoff, G. Riegelbauer, and E. Rosenhauer, Ber. **71,** 2569 **1938.**
20. Sieglitz, A., and H. Jassoy, Ber. **54,** 2133 **1921.**
21. Straus, F., R. Kühnel, and R. Haensel, Ber. **66,** 1847 **1933.**
22. Ziegler, K., and W. Schäfer, Ann. **511,** 101 **1934.**

XX. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-41}

XX. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-44}

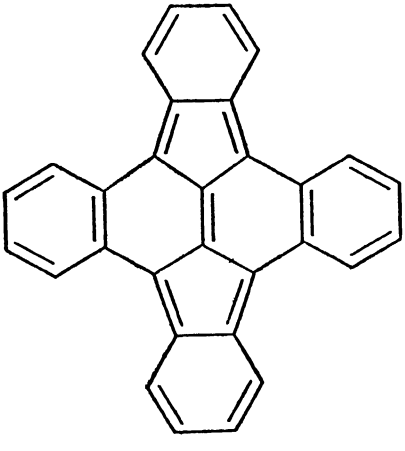
$C_{30}H_{16}$

1,4-Di-(9′fluorylidene)-butatriene



M. P., °C
441–442[9]

Diindo-[3,2,1-fg,3′,2′,1′-op]-naphthacene
(Diphenylenerubene)



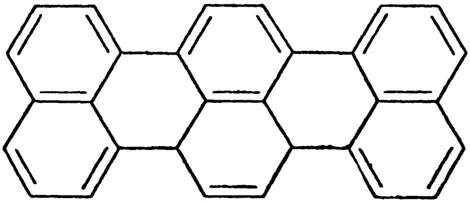
M. P., °C
465[3, 5]

Additional Data
Sublimation Temp. (°C)

270–275	0.1 mm[5]

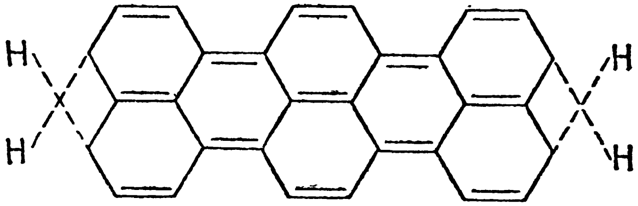
This series continued on next page

Dinaphtho-[1,8-ab,1′,8′-hi]-pyrene
(Chalcacene) (a)



M. P., °C
358–360[6, 7]

(Rhodacene) (b)

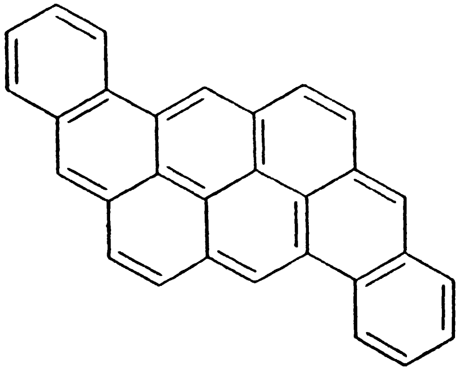


M. P., °C
338–340[6]

(a) This name is given to the form of the compound having a benzenoid structure.

(b) This name is given to the form of the compound having a quinoid structure.

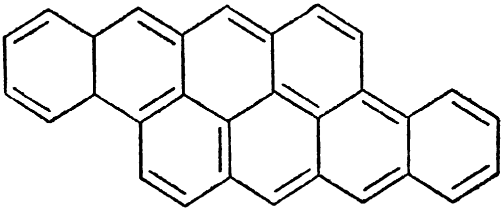
Dinaphtho-[3,2,1-cd,3′,2′,1′-jk]-pyrene



M. P., °C
372–373[4]

This series continued on next page

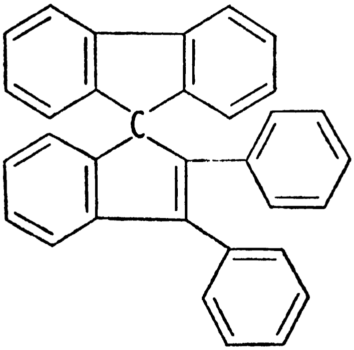
Dinaphtho-[4,3,2-cd,4′,3′,2′-jk]-pyrene



M. P., °C 382-390[4]

$C_{33}H_{22}$

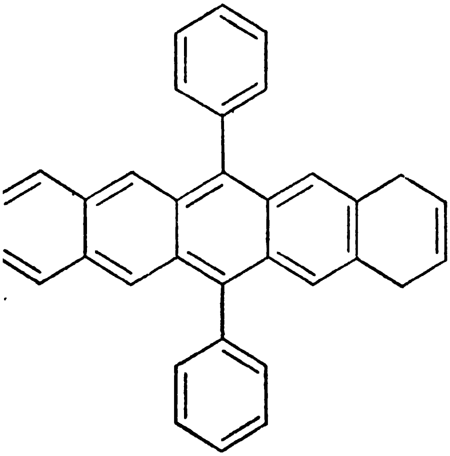
Spiro [2,3-diphenylindene-1,9′-fluorene]



M. P., °C 174-175[3]

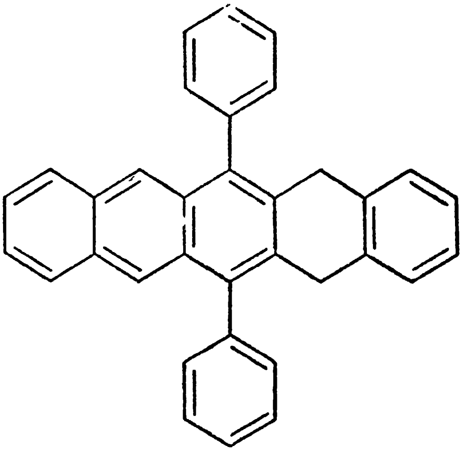
$C_{34}H_{24}$

6,13-Diphenyl-1,4-dihydropentacene



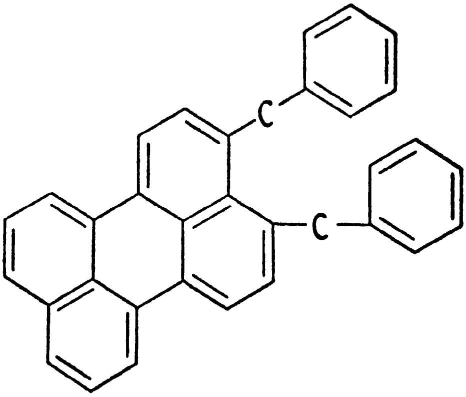
. P., °C 295[1]

6,13-Diphenyl-5,14-dihydropentacene



M. P., °C 247-248[1]

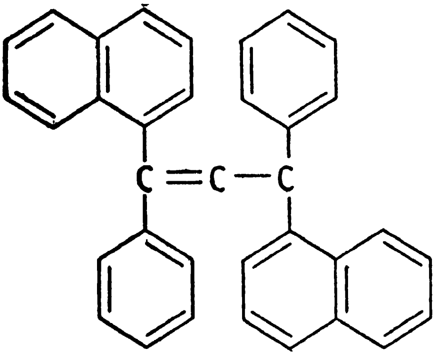
3,4-Dibenzylperylene



M. P., °C 329-330[18]

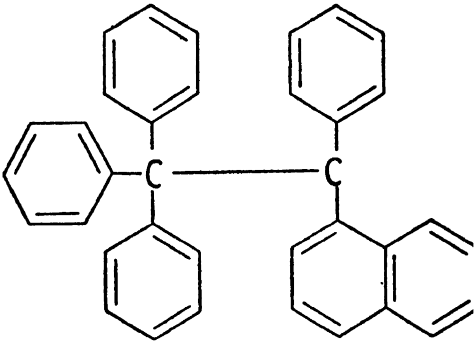
$C_{35}H_{26}$

1,3-Diphenyl-1,3-di-(1′-naphthyl)-propene-1



M. P., °C
167–169[11]

1,1,1,2-Tetraphenyl-2-(1′-naphthyl)-ethane



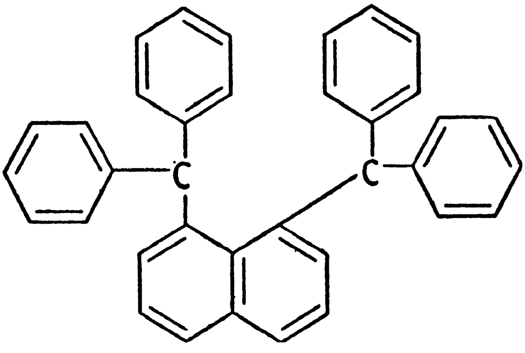
M. P., °C
194–196 (in nitrogen)[2]
184–194 (in air)[2]

References on Polynuclear Aromatics of Empirical Formula C_nH_{2n-44}

1. Allen, C. F. H., and A. Bell, J. Am. Chem. Soc. **64**, 1253 **1942**.
2. Bachmann, W. E., J. Am. Chem. Soc. **55**, 2135 **1939**.

$C_{36}H_{28}$

1,8-Dibenzhydrylnaphthalene



M. P., °C
243[12]

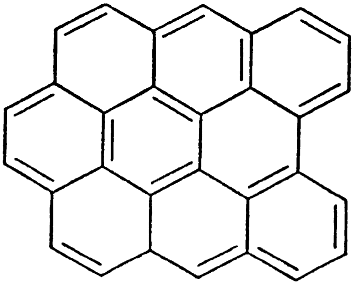
3. Badoche, M., Ann. chim. [10] **20,** 200 **1933.**
4. Clar, E., Ber. **76,** 328 **1943.**
5. Dufraisse, C., and R. Girard, Bull. soc. chim. [5] **1,** 1359 **1934.**
6. Dziewoński, K., Ber. **53,** 2173 **1920.**
7. Dziewoński, K., Bull. intern. acad. polon. sci., Classe sci. math. nat. **1919A,** 99.
8. Koelsch, C. F., J. Am. Chem. Soc. **54,** 3384 **1932.**
9. Kuhn, R., and K. Wallenfels, Ber. **71,** 783 **1938.**
10. Kuhn, R., and K. Wallenfels, Ber. **71,** 1510 **1938.**
11. Maitland, P., and W. H. Mills, J. Chem. Soc. **1936,** 987.
12. Wittig, G., and H. Petri, Ber. **68,** 924 **1935.**
13. Zinke, A., and O. Benndorf, Monatsh. **56,** 153 **1930;** C.A. **25,** 292 **1931;** Chem. Zentr. **1931,** I, 276.

XXI. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-46}

XXI. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-46}

$C_{30}H_{14}$

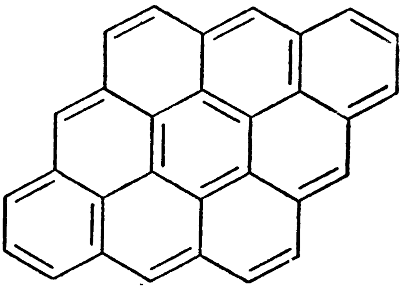
Dibenzo-[bc,ef]-coronene



Additional Data
Sublimation Temp. (°C)

ca 500	1 mm[12]

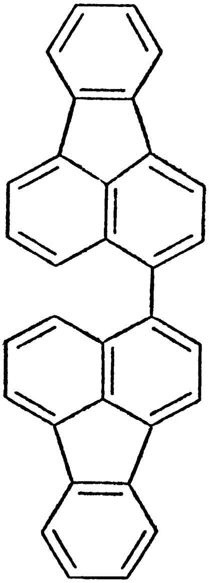
Dibenzo-[bc,kl]-coronene



Additional Data
Sublimation Temp. (°C)
450–500[12]

$C_{32}H_{18}$

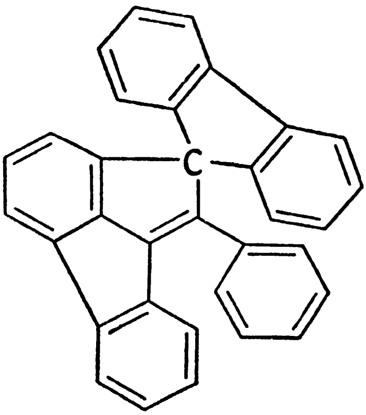
4,4′-Bi-(1,2-benzoacenaphthyl)



M. P., °C 327–329[22]

$C_{33}H_{20}$

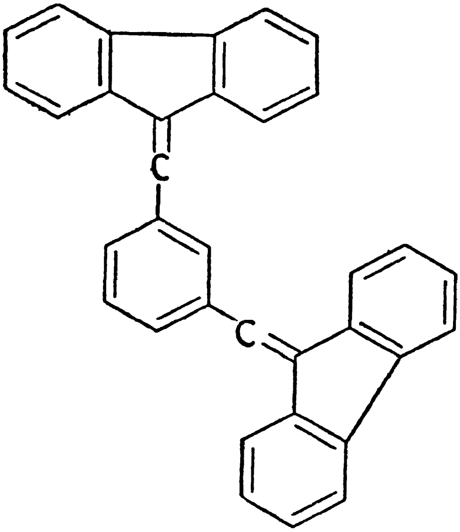
Spiro[indo-[3′,2′,1′-cd]-2-phenylindene-1,9″-fluorene]



M. P., °C 196–197[9]

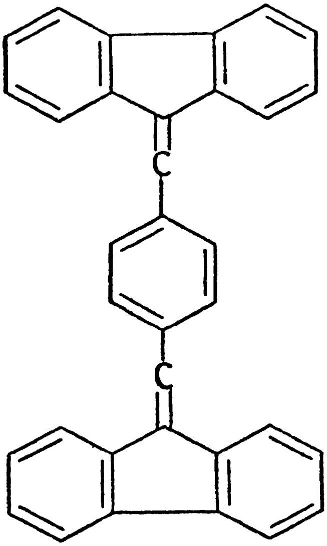
$C_{34}H_{22}$

1,3-Di-(9′-fluorylidenemethyl)-benzene



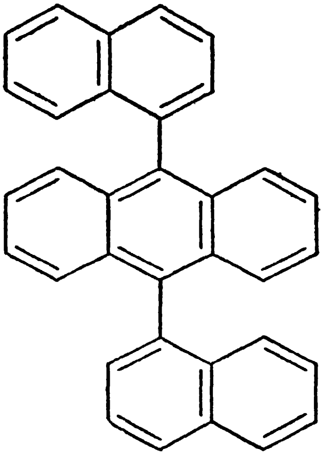
M. P., °C
178–179[16]

1,4-Di-(9′-fluorylidenemethyl)-benzene



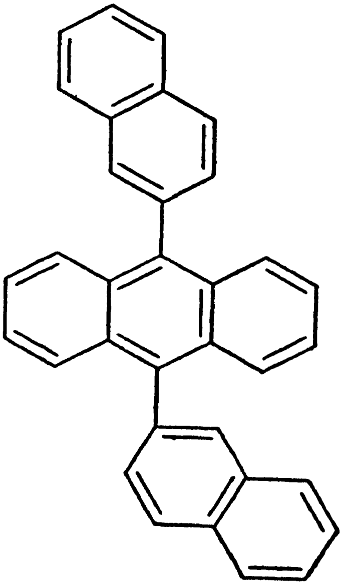
M. P., °C
209–210[15]

9,10-Di-(1′-naphthyl)-anthracene



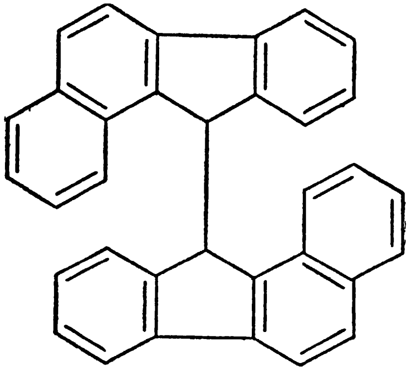
M. P., °C
430–431[24]
430[23]

9,10-Di-(2′-naphthyl)-anthracene



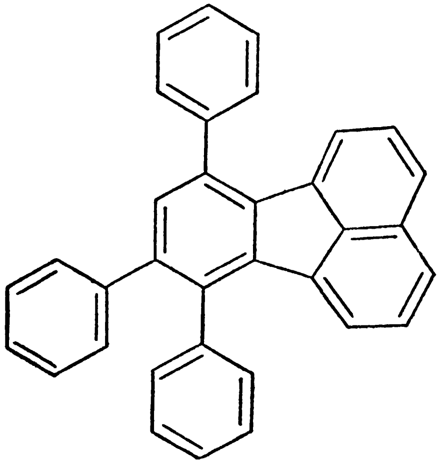
M. P., °C
379[23]
378–379[24]

Bi-9,9′-(1,2-benzofluoryl)



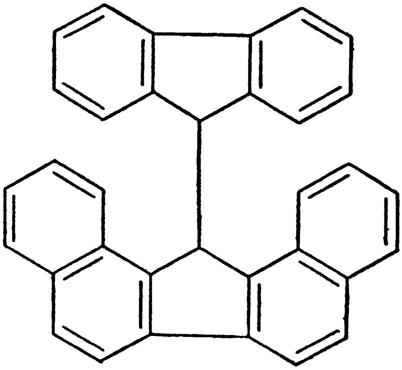
M. P., °C
257[20]
221[21]

2,3-(2′,1′-Acenaphtho)-1,4,5-triphenylbenzene



M. P., °C
195–196[7]

1,2,7,8-Dibenzo-9-(9′-fluoryl)-fluorene (a)

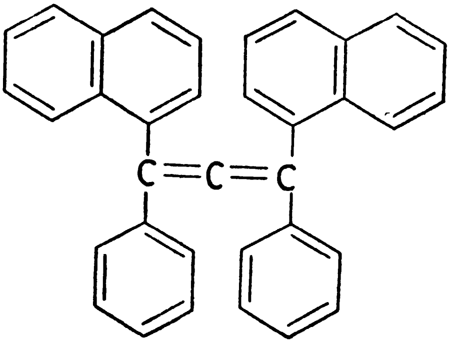


M. P., °C
270[20, 21]

(a) The structure of this compound was not clearly defined in the literature.

$C_{35}H_{24}$

1,3-Diphenyl-1,3-di-(1′-naphthyl)-propadiene



M. P., °C
242–244 (a)[10, 11]
240[5]
158–159 (b) (c)[10, 11]

Additional Data
$[\alpha]^{17}_{5461} = +437°$ (b)[10, 11]
$[\alpha]^{17}_{5461} = -438°$ (c)[10, 11]

(a) This constant was determined on the *dl*-form of the compound.

(b) This constant was determined on the *d*-form of the compound.

(c) This constant was determined on the *l*-form of the compound.

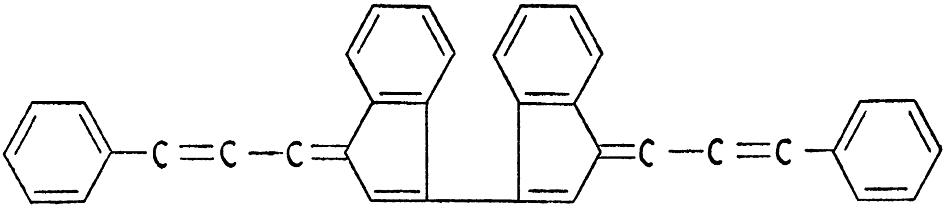
Di-(x,x'-phenanthryl)-phenylmethane (a)

M. P., °C
165[8]

(a) The structure of this compound was not clearly defined in the literature.

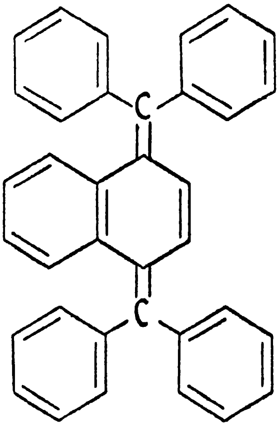
$C_{36}H_{26}$

Bi-3,3'-[1-(3''-phenylpropen-2''-ylidene)-indenyl]



M. P., °C
251[19]

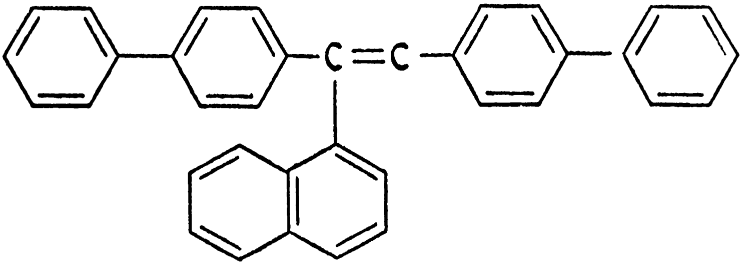
1,4-Dibenzhydrylidene-1,4-dihydronaphthalene



M. P., °C
262-263[17]

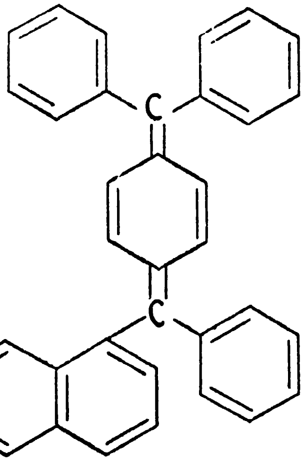
This series continued on next page

1-(1′-Naphthyl)1,2-di-*p*-biphenylylethene



M. P., °C
209–214[14]

1-Benzhydrylidene-4-(1′-naphthylphenylmethylene)-cyclohexadiene-2,5



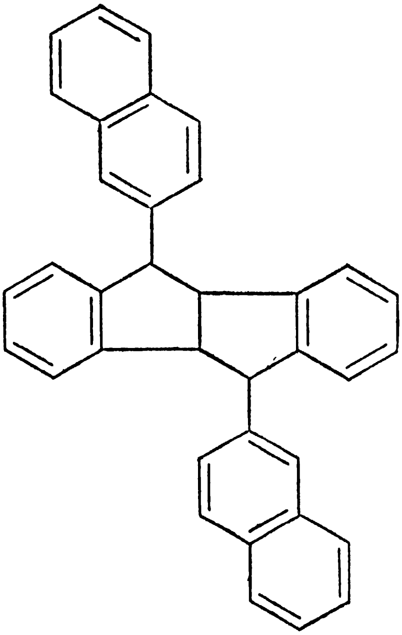
M. P., °C
240–241 (in carbon dioxide)[4]
238–239 (in carbon dioxide)[1]

x-Benzhydrylidene-x,x-diphenyl-x,x-benzocycloheptadiene-x,x (a)

M. P., °C
181–182[18]

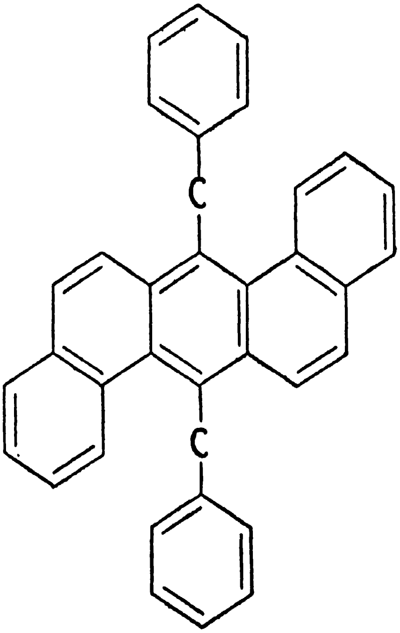
(a) The structure of this compound was not clearly defined in the literature.

2,3,6,7-Dibenzo-4,8-di-(2′-naphthyl)-bicyclo-[3,3,0]-octane



M. P., °C
225[3]

1,2,5,6-Dibenzo-9,10-dibenzylanthracene



M. P., °C
195–201 (a)[6]

(a) This compound melts with decomposition.

---

x,x,x-Triphenyl-x,x-dihydronaphthacene (a)

M. P., °C
208–209[2]

(a) The structure of this compound was not clearly defined in the literature.

References on Polynuclear Aromatics of Empirical Formula C_nH_{2n-46}

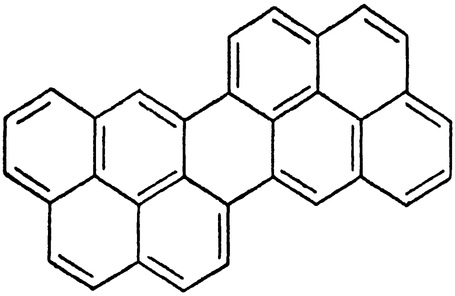
1. Allard, S., Compt. rend. **199,** 423 **1934.**
2. Badoche, M., Bull. soc. chim. [5] **5,** 164 **1938.**
3. Brand, K., and K. Trebing, Ber. **56,** 2545 **1923.**
4. Chichibabin, A. E., Ber. **41,** 2770 **1908.**
5. Clemo, G. R., R. Raper, and A. C. Robson, J. Chem. Soc. **1939,** 431.
6. Cook, J. W., J. Chem. Soc. **1931,** 489.
7. Dilthey, W., S. Henkels, and A. Schaefer, Ber. **71,** 974 **1938.**
8. Frankforter, G., and W. Kritchevsky, J. Am. Chem. Soc. **37,** 385 **1915.**
9. Koelsch, C. F., J. Am. Chem. Soc. **54,** 4744 **1932.**
10. Maitland, P., and W. H. Mills, J. Chem. Soc. **1936,** 987.
11. Maitland, P., and W. H. Mills, Nature **135,** 994 **1935.**
12. Scholl, R., and K. Meyer, Ber. **65,** 902 **1932.**
13. Scholl, R., and K. Meyer, Ber. **67,** 1229 **1934.**
14. Shilov, E. A., and F. K. Yudin, J. Gen. Chem. (U.S.S.R.) **9,** 167 **1939;** C. A. **33,** 6283 **1939.**
15. Sieglitz, A., Ber. **52,** 1513 **1919.**
16. Sieglitz, A., Ber **53,** 1232 **1920.**
17. Staudinger, H., Ber. **41,** 1355 **1908.**
18. Staudinger, H., and H. Kon, Ann. **384,** 38 **1911.**
19. Straus, F., R. Kuhnel, and R. Haensel, Ber. **66,** 1847 **1933.**
20. Vansheidt, A., Ber. **59,** 2092 **1926.**
21. Vansheidt, A. A., J. Russ. Phys. Chem. Soc. **58,** 69 **1926;** C. A. **21,** 581 **1927;** Chem. Zentr. **1926,** II, 24, 28.
22. von Braun, J., and G. Manz, Ber. **70,** 1603 **1937.**
23. Willemart, A., Bull. soc. chim. [5] **4,** 357 **1937.**
24. Willemart, A., Compt. rend. **201,** 1201 **1935.**

XXII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-48}

XXII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-48}

$C_{32}H_{16}$

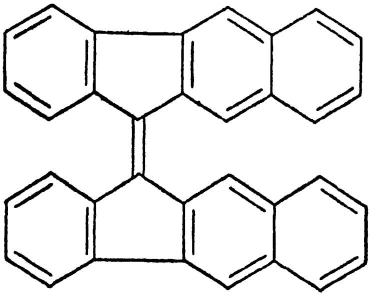
Dinaphtho-[2,1,8-cde,2′,1′,8′-lmn]-perylene



M. P., °C
213–214[17]

$C_{34}H_{20}$

9,9′-Bi-(2,3-benzofluorylidene)



M. P., °C
232[15]

***sym*-Di-α-naphthylenediphenylene-ethene (a)**

M. P., °C
317–318[16]

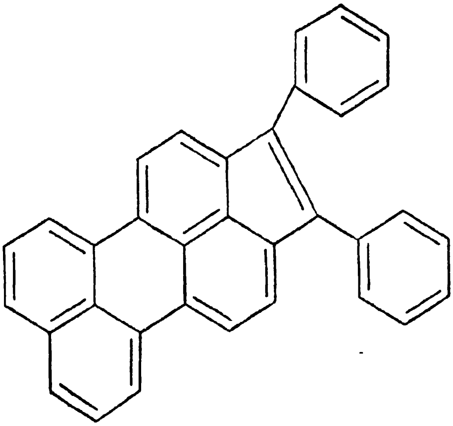
(a) The structure of this compound was not clearly defined in the literature.

***unsym*-Di-α-naphthylenediphenylene-ethene (a)**

M. P., °C
315[16]

(a) The structure of this compound was not clearly defined in the literature.

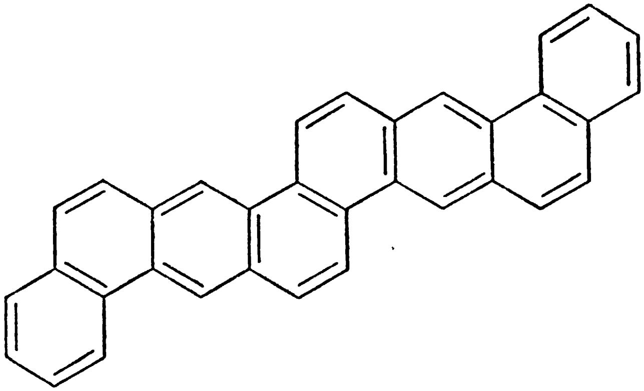
(4,5-Diphenylcyclopenten-4-o)-[cd]-perylene



M. P., °C
315–316[21]

This series continued on next page

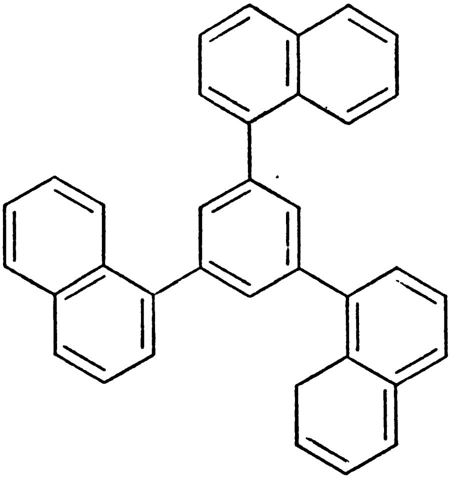
2,3,8,9-Di-(4′,3′-naphtho)-chrysene



M. P., °C
500[10]

$C_{36}H_{24}$

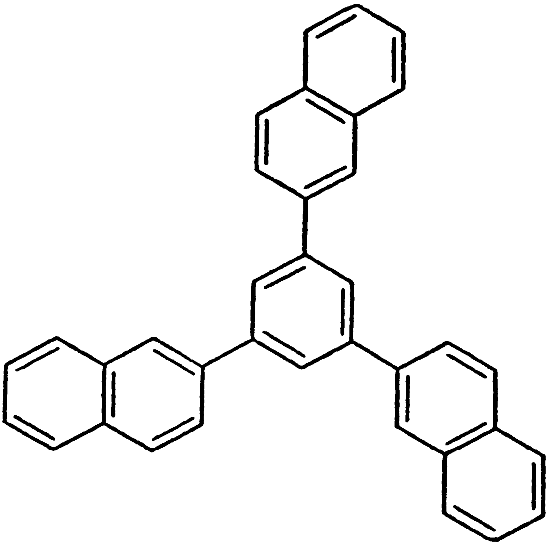
1,3,5-Tri-(1′-naphthyl)-benzene



M. P., °C
190.5–191[5]

This series continued on next page

1,3,5-Tri-(2′-naphthyl)-benzene



M. P., °C
234–235[5]

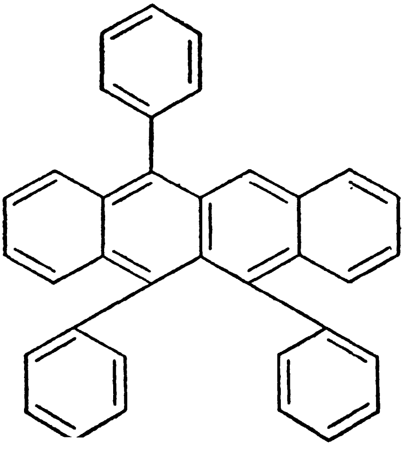
---

x,x-Di-*p*-biphenylylacenaphthylene (a)

M. P., °C
189.5–190.5[1]

(a) The structure of this compound was not clearly defined in the literature.

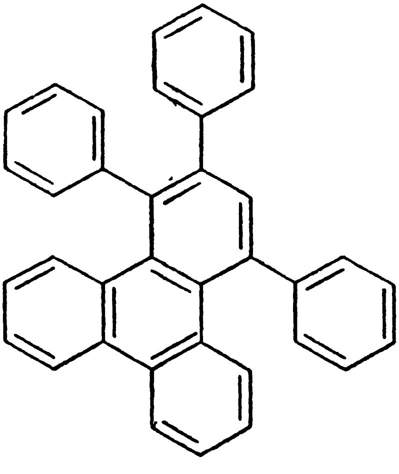
5,6,11-Triphenylnaphthacene (a)
(Triphenylrubene)



M. P., °C
236–237[3, 4, 7, 9]

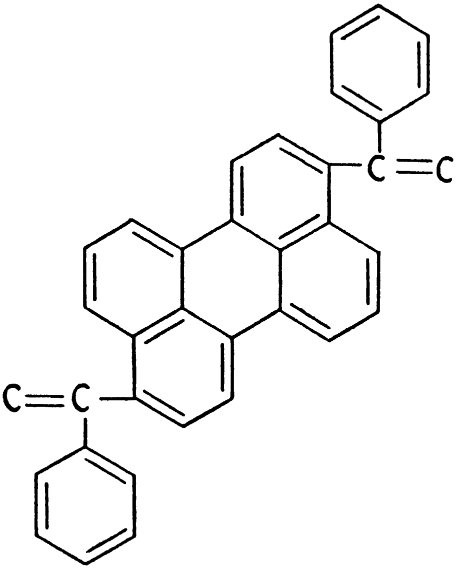
(a) This compound was named Diphenylrubrene in reference 7.

1,2,4-Triphenyltriphenylene



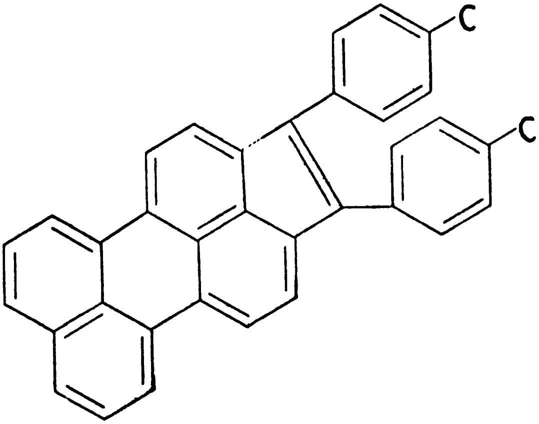
M. P., °C
250[6]

3,9-Di-(1′-phenethenyl)-perylene



M. P., °C
257–258[21]

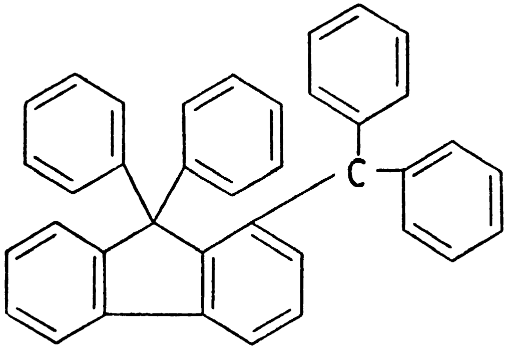
(4,5-Di-*p*-tolylcyclopenten-4-o)-[cd]-perylene



M. P., °C
326.5–327.5[12]

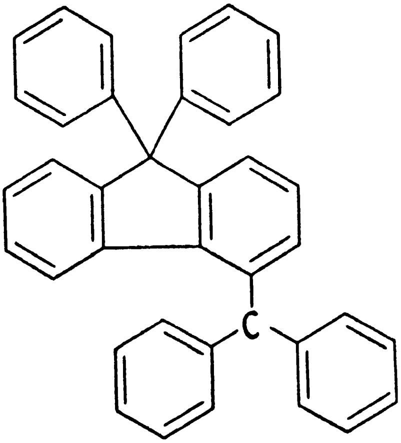
$C_{38}H_{28}$

1-Benzhydryl-9,9-diphenylfluorene



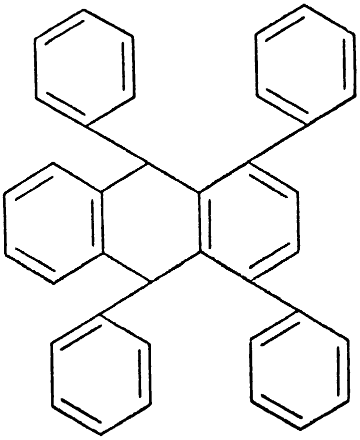
M. P., °C
219-220[14]

4-Benzhydryl-9,9-diphenylfluorene



M. P., °C
219.5-221[19]
219-220[14]

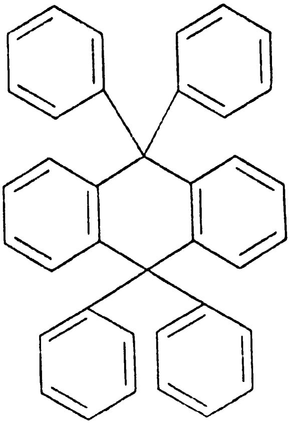
1,4,9,10-Tetraphenyl-9,10-dihydroanthracene



M. P., °C
217 (a)[18]
205 (a)[18]

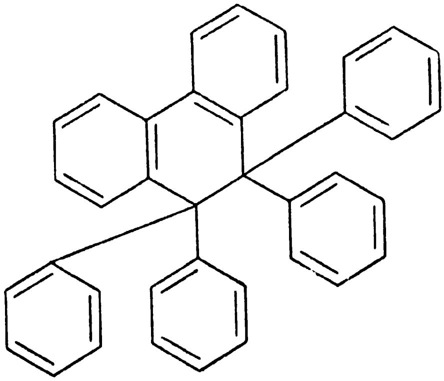
(a) These constants were determined on stereoisomers.

9,9,10,10-Tetraphenyl-9,10-dihydroanthracene



M. P., °C
159[13, 20]

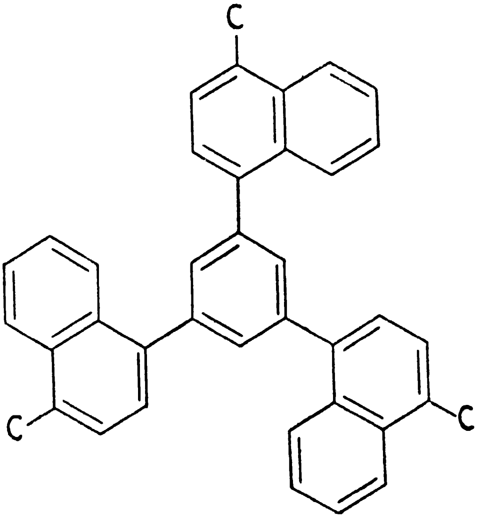
9,9,10,10-Tetraphenyl-9,10-dihydrophenanthrene



M. P., °C
339.5–341[19]

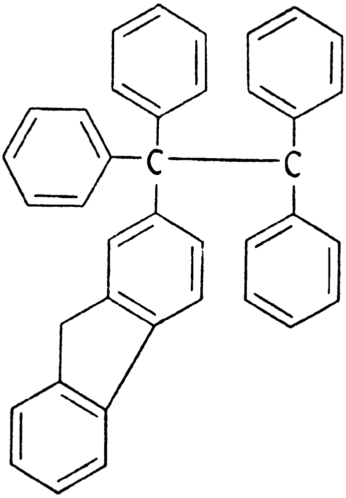
$C_{39}H_{30}$

1,3,5-Tri-[1′-(4′-methylnaphthyl)]-benzene



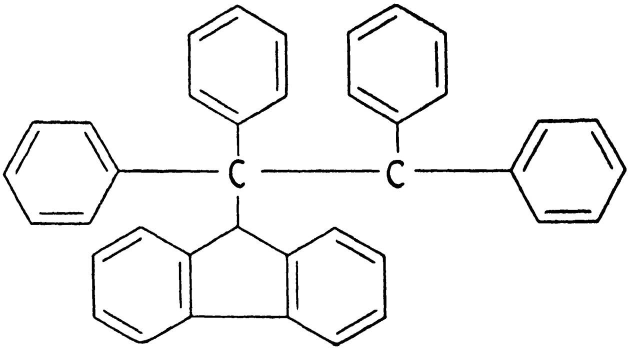
M. P., °C
185[8]

1,1,2,2-Tetraphenyl-1-(2′-fluoryl)-ethane



M. P., °C
187–190 (in nitrogen)[2]
168–176[2]

1,1,2,2-Tetraphenyl-1-(9′-fluoryl)-ethane



M. P., °C
205[11]

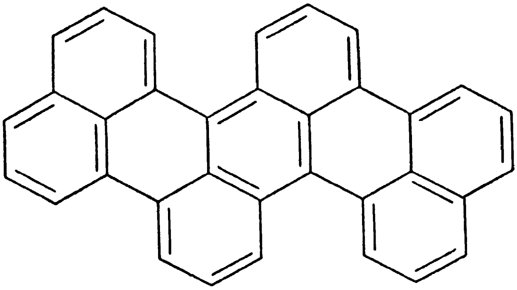
References on Polynuclear Aromatics of Empirical Formula C_nH_{2n-48}

1. Bachmann, W. E., and E. J.-H. Chu, J. Am. Chem. Soc. **58,** 1118 **1936.**
2. Bachmann, W. E., R. Hoffman, and F. Whitehead, J. Org. Chem. **8,** 320 **1943.**
3. Badoche, M., Bull. soc. chim. [5] **3,** 2040 **1936.**
4. Badoche, M., Bull. soc. chim. [5] **5,** 164 **1938.**
5. Clapp, D. B., and A. A. Morton, J. Am. Chem. Soc. **58,** 2172 **1936.**
6. Dilthey, W., S. Henkels, and A. Schaefer, Ber. **71,** 974 **1938.**
7. Dufraisse, C., and M. Badoche, Compt. rend. **193,** 242 **1931.**
8. Dziewoński, K., and M. Marusińska, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1938A,** 316.
9. Enderlin, L., Ann. chim. [11] **10,** 5 **1938.**
10. Fieser, L. F., and E. M. Dietz, Ber. **62,** 1827 **1929.**
11. Klinger, H., and C. Lonnes, Ber. **29,** 734 **1896.**
12. Pongretz, A., and G. Markgraf, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **144,** Abt. IIb, 308 **1935.**
13. Rây, J. N., J. Chem. Soc. **117,** 1335 **1920.**
14. Sergeev, P. G., J. Russ. Phys. Chem. Soc. **61,** 1421 **1929;** C.A. **24,** 1365 **1930;** Chem. Zentr. **1930,** II, 391.
15. Thiele, J., and A. Vansheidt, Ann. **376,** 269 **1910.**
16. Vansheidt, A. A., J. Russ. Phys. Chem. Soc. **58,** 249 **1926;** C.A. **21,** 3616 **1927;** Chem. Zentr. **1927,** I, 92.
17. Vollmann, H., H. Becker, M. Corell, and H. Streeck, Ann. **531,** 1 **1937.**
18. Weizmann, C., and E. Bergmann, J. Chem. Soc. **1939,** 494.
19. Wittig, G., and H. Petri, Ann. **505,** 17 **1933.**
20. Wohl, A., and E. Wertyporoch, Ann. **481,** 30 **1930.**
21. Zinke, A., and O. Benndorf, Monatsh. **56,** 153 **1930;** C.A. **25,** 292 **1931;** Chem. Zentr. **1931,** I, 276.

XXIII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-50}

$C_{34}H_{18}$

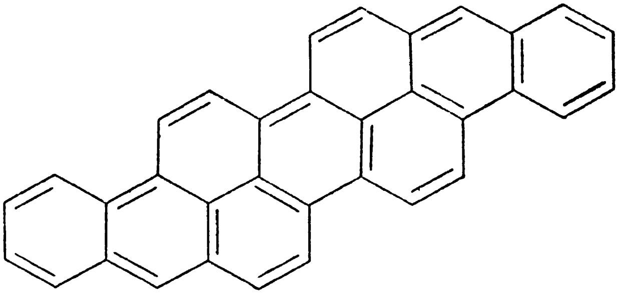
Tetrabenzo-[de,hi,op,st]-pentacene (a)



M. P., °C
580 (in sealed tube)[8]

(a) This compound exists in solution with free valences in the 5a- and 12a-positions.

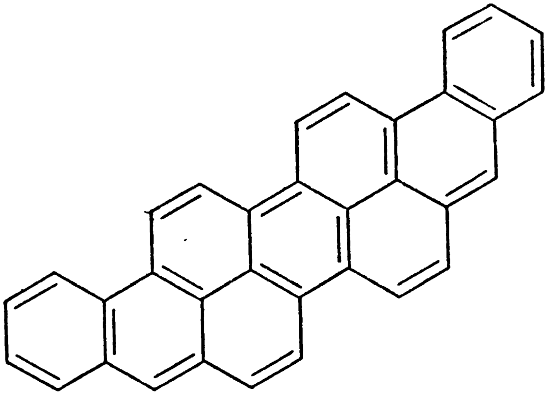
Dinaphtho-[3,2,1-cd,3′,2′,1′-lm]-perylene
(Isoviolanthrene)



M. P., °C
510[7]

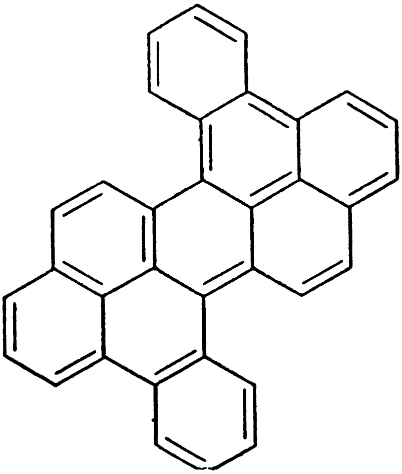
Additional Data
Sublimation Temp. (°C)
460 (in carbon dioxide)[28]

Dinaphtho-[4,3,2-cd,3′,2′,1′-lm]-perylene
(Violanthrene)



M. P., °C
478[7]

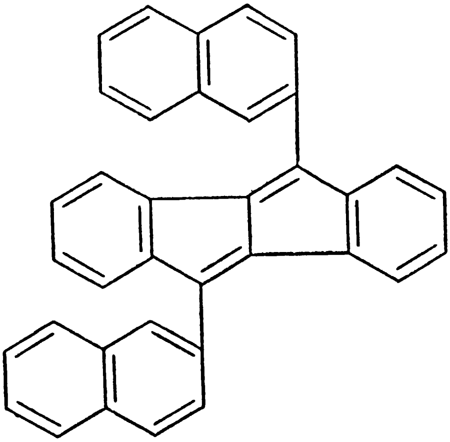
Tetrabenzo-[a,cd,j,lm]-perylene



M. P., °C
331–332[7]

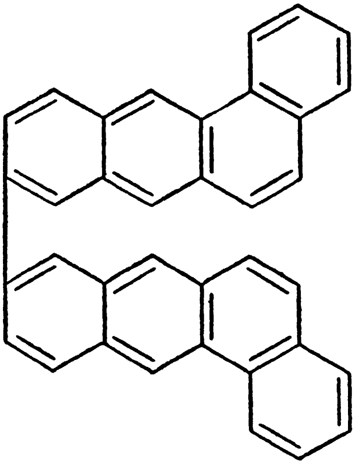
$C_{36}H_{22}$

3,4,7,8-Dibenzo-2,6-di-(2′-naphthyl)-bicyclo-[3,3,0]-octadiene-1,5



M. P., °C
266[6]

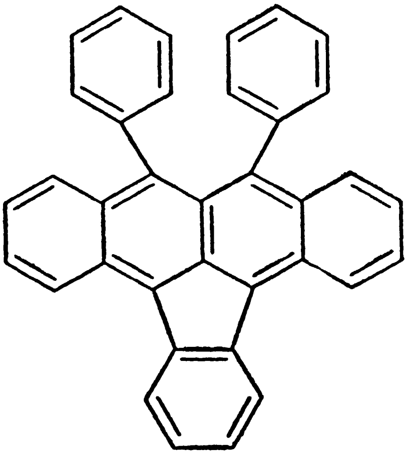
6,6′-Bi-(1,2-benzoanthryl) (a)



M. P., °C
310[10]

(a) The structure of this compound may be 7,7′-Bi-(1,2-benzoanthryl).

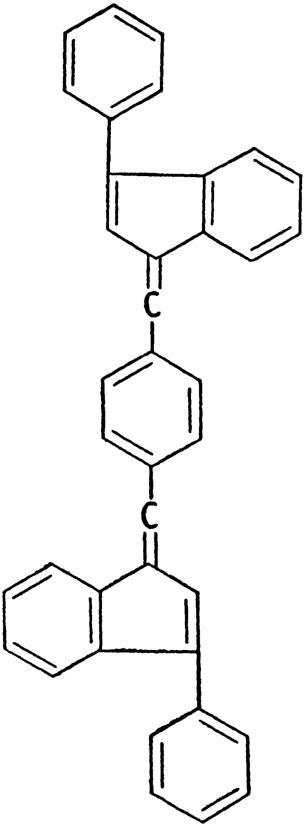
Indo-[3′,2′,1′-fg]-11,12-diphenylnaphthacene
(Diphenylphenylenerubene)



M. P., °C
270–271[11]

$C_{38}H_{23}$

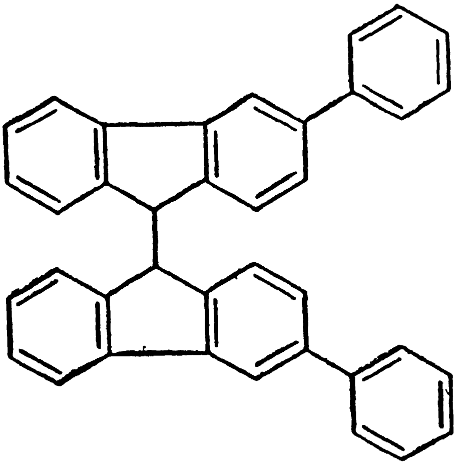
1,4-Di-(3′-phenylindenylidenemethyl)-benzene



M. P., °C
231–232[15]

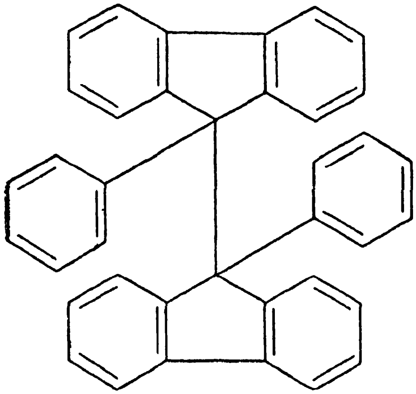
This series continued on next page

9,9′-Bi-(3-phenylfluoryl)



M. P., °C
190–193[9]

9,9′-Bi-(9-phenylfluoryl)



M. P., °C
256[21, 22]
254[19]
248–250[20]

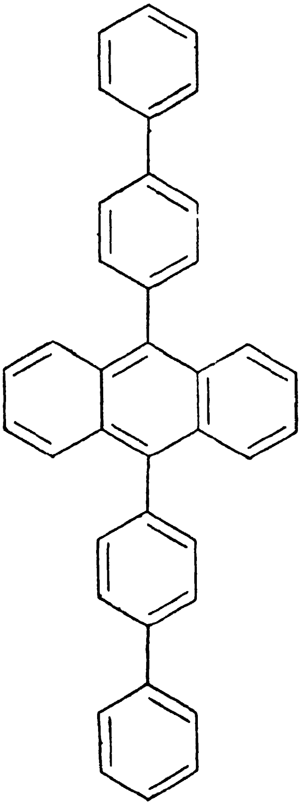
D_4^{20}
1.266 0°[27]

9,9′-Bi-(x-phenylfluoryl) (a)

M. P., °C
225[5]

(a) The structure of this compound was not clearly defined in the literature.

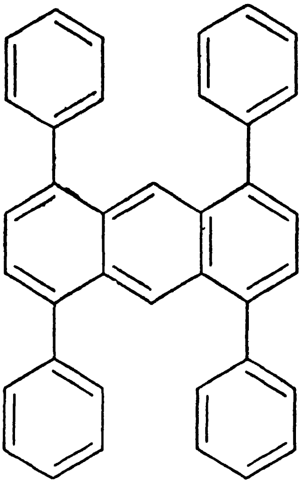
9,10-Di-*p*-biphenylylanthracene



M. P., °C
415[12]

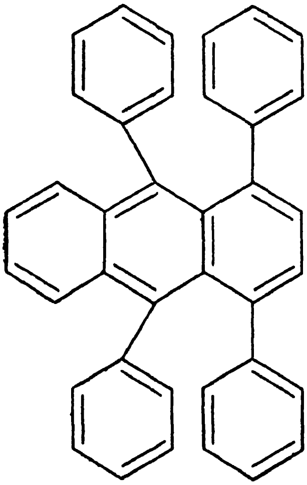
This series continued on next page

1,4,5,8-Tetraphenylanthracene



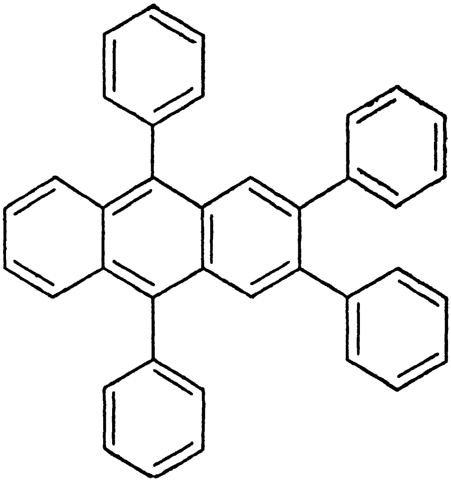
M. P., °C
370[13]

1,4,9,10-Tetraphenylanthracene



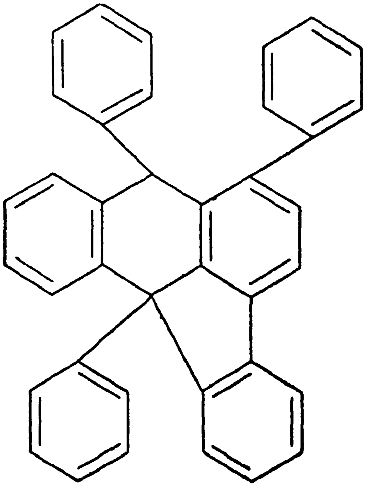
M. P., °C
205[25, 26]
204[24]

2,3,9,10-Tetraphenylanthracene



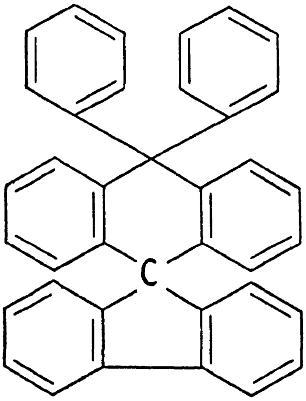
M. P., °C
324–325[1]

Indo-[3′,2′,1′-de]-1,9,10-triphenyl-9,10-dihydroanthracene



M. P., °C
322[25, 26]

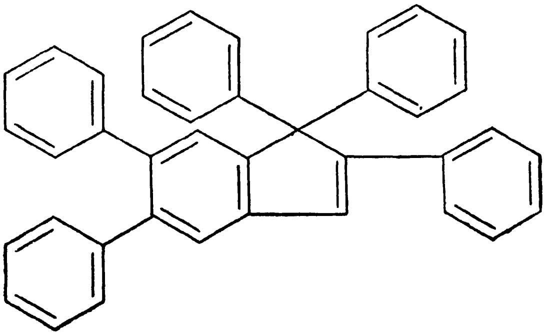
Spiro[9,9-diphenyl-9,10-dihydroanthracene-10,9′-fluorene]



M. P., °C 363–364[9]

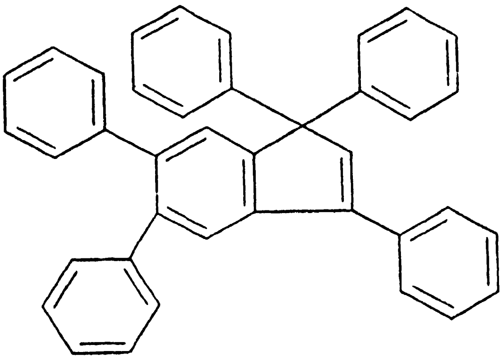
$C_{39}H_{28}$

1,1,2,5,6-Pentaphenylindene



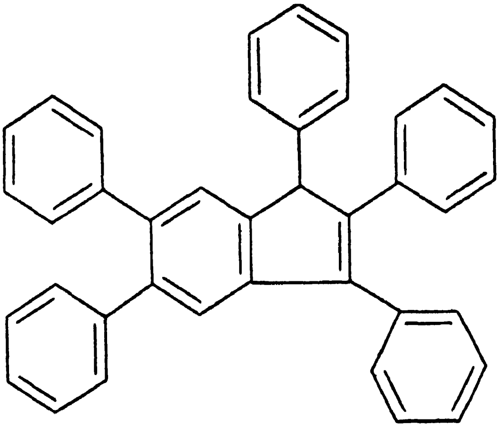
M. P., °C 222[1]

1,1,3,5,6-Pentaphenylindene



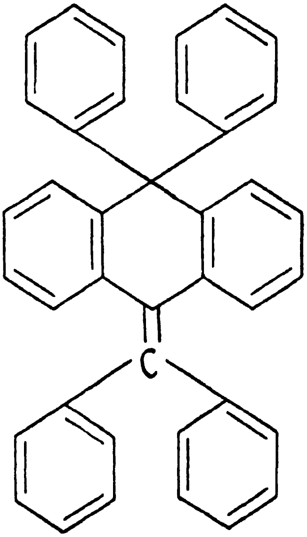
M. P., °C 227[1]

1,2,3,5,6-Pentaphenylindene



M. P., °C
280[1]

9,9-Diphenyl-10-benzhydrylidene-9,10-dihydroanthracene

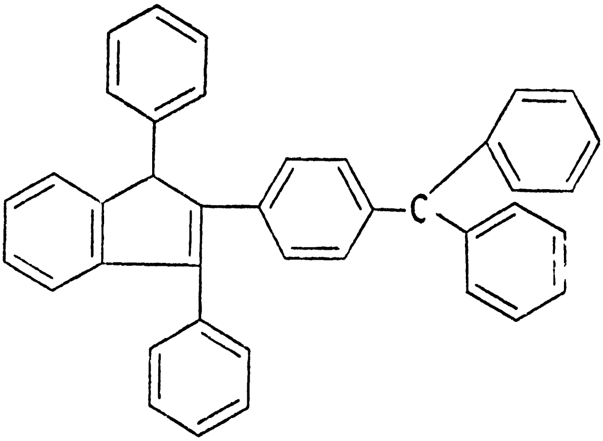


M. P., °C
286[3]
276[4]

This series continued on next page

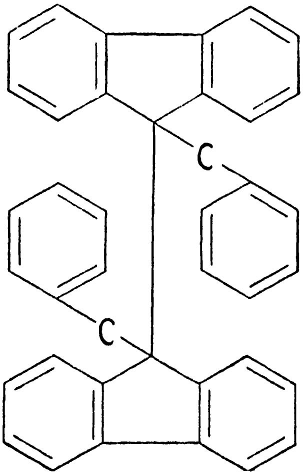
$C_{40}H_{30}$

1,3-Diphenyl-2-(4′-benzhydrylphenyl)-indene



M. P., °C
173–175[14]

9,9′-Bi-(9-benzylfluoryl)



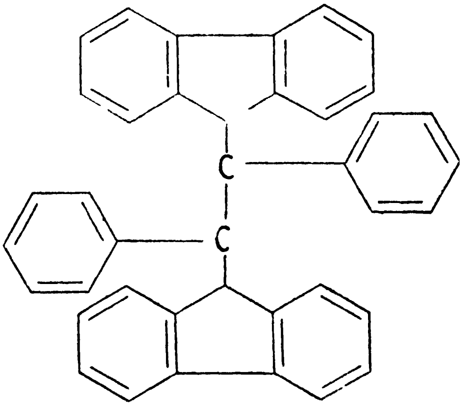
M. P., °C
203–203.5[23]
203[22]

x,x′-Bi-(x-*p*-tolylfluoryl) (a)

M. P., °C
216[16]

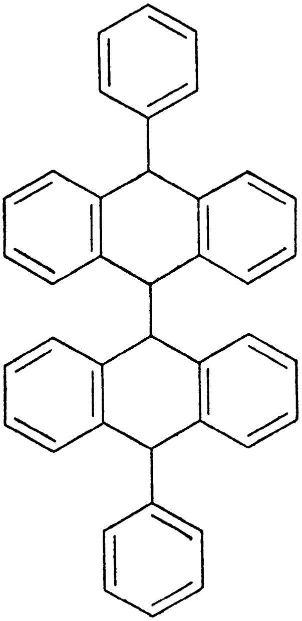
(a) The structure of this compound was not clearly defined in the literature.

1,2-Diphenyl-1,2-di-(9′-fluoryl)-ethane



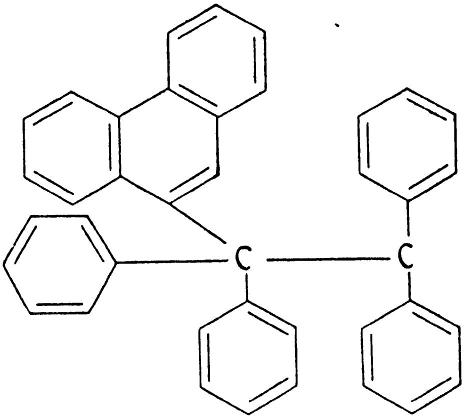
M. P., °C
321[17]

9,9'-Bi-(10-phenyl-9,10-dihydroanthryl)



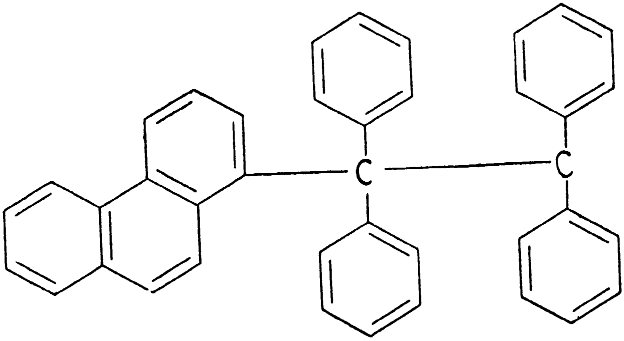
M. P., °C
260[18]

1-(9'-Phenanthryl)-1,1,2,2-tetraphenylethane



M. P., °C
152–155 (in nitrogen)[2]
149–152 (in air)[2]

1-(1'-Phenanthryl)-1,1,2,2-tetraphenylethane



M. P., °C
125–135 (a) (in vacuum)[2]
123–134 (a)[2]

(a) This compound melts with decomposition.

References on Polynuclear Aromatics of Empirical Formula C_nH_{2n-50}

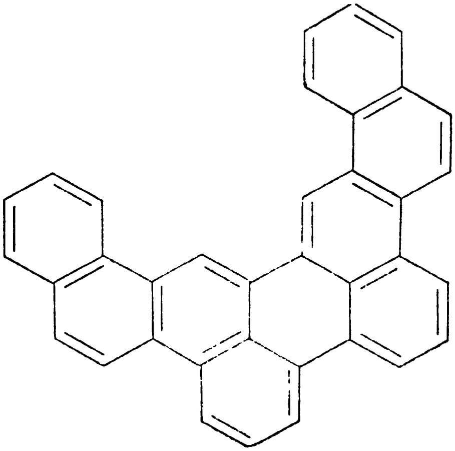
1. Allen, C. F. H., and J. W. Gates, Jr., J. Am. Chem. Soc. **65**, 2129 **1943**.
2. Bachmann, W. E., R. Hoffman, and F. Whitehead, J. Org. Chem. **8**, 320 **1943**.
3. Barnett, E. de B., J. W. Cook, and I. G. Nixon, J. Chem. Soc. **1927**, 504.
4. Bergmann, E , Ber. **63**, 1037 **1930**.
5. Bowden, S. T., J. Chem. Soc. **1939**, 26.
6. Brand, K , and K. Trebing, Ber. **56**, 2515 **1923**.
7. Clar, E., Ber. **76**, 458 **1943**.
8. Clar, E., and A. Guzzi, Ber. **65**, 1521 **1932**.
9. Clarkson, R G., and M. Gomberg, J. Am. Chem. Soc. **52**, 2881 **1930**.
10. Cook, J. W., J. Chem. Soc. **1931**, 499.
11. Dufraisse, C., and M. Badoche, Compt. rend. **193**, 520 **1931**.
12. Duveen, D., and A Willemart, J. Chem. Soc. **1939**, 116.
13. Hirshberg, Y , and L. Haskelberg, Trans. Faraday Soc. **39**, 45 **1943**.
14. Koelsch, C. F., J. Am. Chem. Soc. **58**, 1331 **1936**.
15. Mayer, F., A Sieglitz, and W. Ludwig, Ber. **54**, 1397 **1921**.
16. Scherf, H. W., J. Am. Chem. Soc. **58**, 576 **1936**.
17. Schlenk, W., and E. Bergmann, Ann. **463**, 1 **1928**.
18. Schlenk, W., and E. Bergmann, Ann. **464**, 1 **1928**.
19. Schlenk, W., A. Herzenstein, and T. Weickel, Ber. **43**, 1753 **1910**.
20. Thomas, J. C , S. T. Bowden, and W. C. Jones, J. Chem. Soc. **1930**, 473.
21. Vansheidt, A , and B. Moldavskiĭ, Ber. **63**, 1362 **1930**.
22. Vansheidt, A., and B. Moldavskiĭ, Ber. **64**, 917 **1931**.
23. Vansheidt, A., and B. Moldavskiĭ, J. Gen. Chem. (U. S. S. R.) **1**, 304 **1931**; Chem. Zentr. **1931**, II, 3208.
24. Weizmann, C., and E. Bergmann, J. Chem. Soc. **1939**, 494.
25. Weizmann, C., and E. Bergmann, Scripta Academica Hierosolymitana (Jerusalem) Sci. Rept. No. 1 **1938**.
26. Weizmann, C., E. Bergmann, and L. Haskelberg, J. Chem. Soc. **1939**, 391.
27. Ziegler, K., and F. Ditzel, Ann. **473**, 194 **1929**.
28. Zinke, A., W. Penecke, and F. Hanus, Ber. **69**, 624 **1936**.

XXIV. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-52}

XXIV. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-52}

$C_{36}H_{20}$

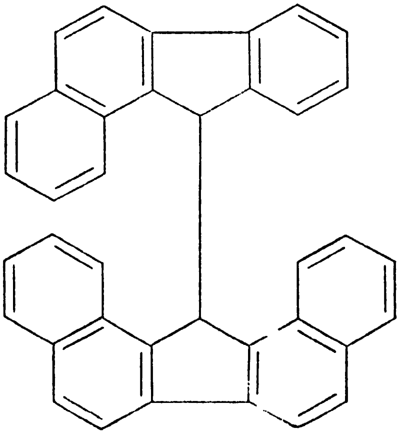
2,3-(4′,3′-Naphtho)-10,11-(2′,1′-naphtho)-perylene



M. P., °C
.240[3]

$C_{38}H_{24}$

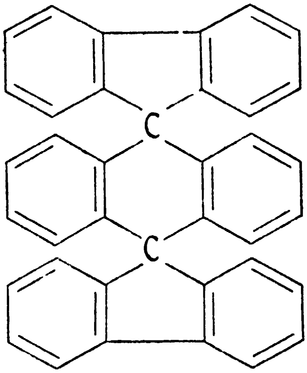
1,2,7,8-Dibenzo-9-[9′-(1′,2′-benzo-fluoryl)]-fluorene (a)



M. P., °C
267[5, 6]

(a) The structure of this compound was not clearly defined in the literature.

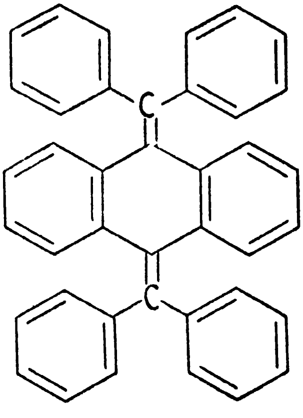
Dispiro[fluorene-9,9′-(9′,10′-dihydro-anthracene)-10′,9″-fluorene]



M. P., °C
471–474[1]

$C_{40}H_{28}$

9,10-Dibenzylidene-9,10-dihydro-anthracene



M. P., °C
305[2]
302–303[4]

References on Polynuclear Aromatics of Empirical Formula C_nH_{2n-52}

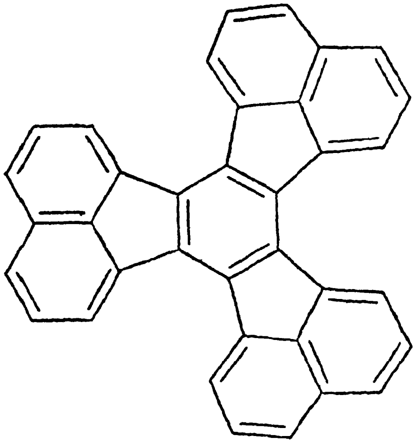
1. Clarkson, R. G., and M. Gomberg, J. Am. Chem. Soc. **52**, 2881 **1930.**
2. Padova, R., Compt. rend. **148**, 290 **1909.**
3. Schiedt, B., Ber. **71**, 1248 **1938.**
4. Staudinger, H., Ber. **41**, 1355 **1908.**
5. Vansheidt, A., Ber. **59**, 2092 **1926.**
6. Vansheidt, A. A., J. Russ. Phys. Chem. Soc. **58**, 69 **1926**; C. A. **21**, 581 **1927**; Chem. Zentr. **1926**, II, 2428.

XXV. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-54}

XXV. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-54}

$C_{36}H_{18}$

1,2,3,4,5,6-Tri-(2′,1′-acenaphtho)-benzene
(Decacyclene)



M. P., °C
388
390[24]
389.5[16, 17]
387[9, 10, 11, 12, 13]

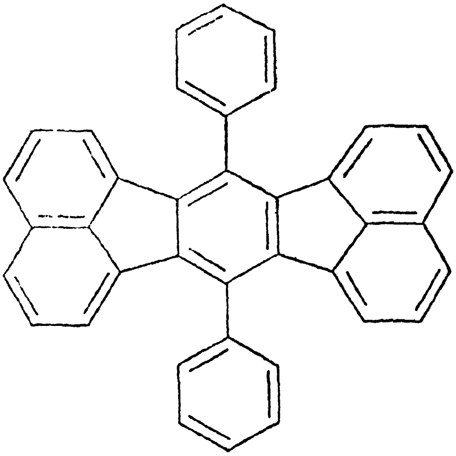
$C_{38}H_{22}$

Tri-α-naphthylenephenylene-ethene (a)

M. P., °C
300[22]

(a) The structure of this compound was not clearly defined in the literature.

2,3,5,6-Di-(2′,1′-acenaphtho)-1,4-diphenylbenzene



M. P., °C
403[5]

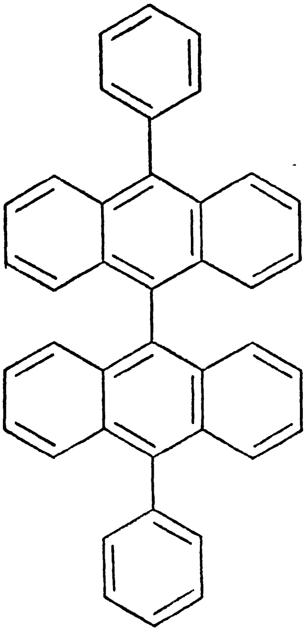
$C_{40}H_{26}$

Tetranaphthyl (a)

M. P., °C
235[1]

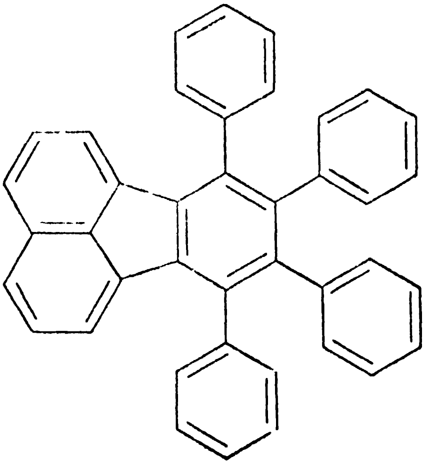
(a) The structure of this compound was not clearly defined in the literature.

9,9′-Bi-(10-phenylanthryl)



M. P., °C
390–391[8]

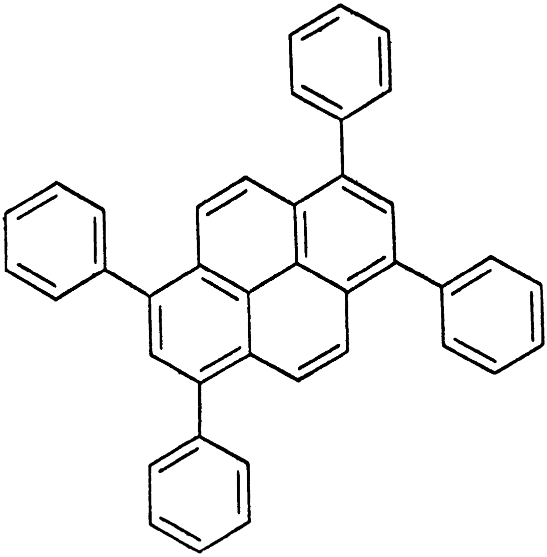
1,2,3,4-Tetraphenyl-5,6-(2′,1′-acenaphtho)-benzene



M. P., °C
314[5]

This series continued on next page

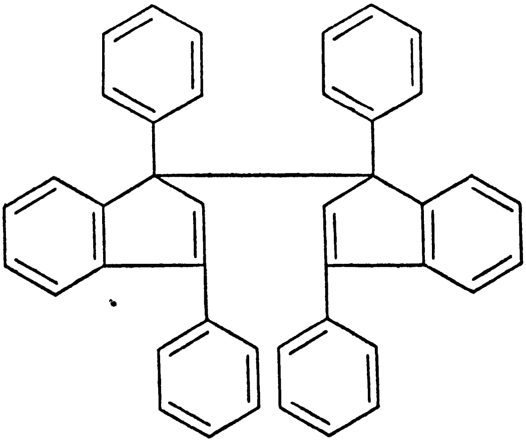
1,3,6,8-Tetraphenylpyrene



M. P., °C
299–300[23]

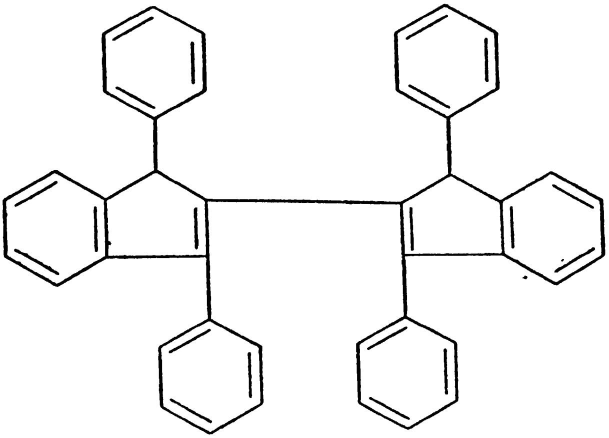
$C_{42}H_{30}$

1,1′-Bi-(1,3-diphenylindenyl)



M. P., °C
195–196[14]
190–191[15]

2,2′-Bi-(1,3-diphenylindenyl)



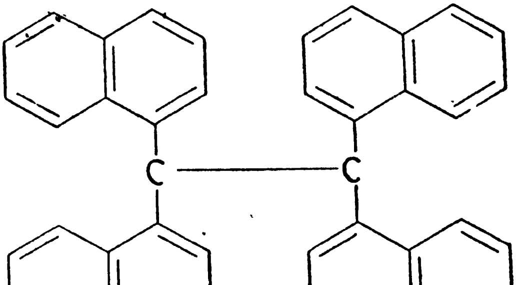
M. P., °C

249–250 (a)[7]

224–225 (a)[7]

(a) These constants were determined on stereoisomers.

1,1,2,2-Tetra-(1′-naphthyl)-ethane



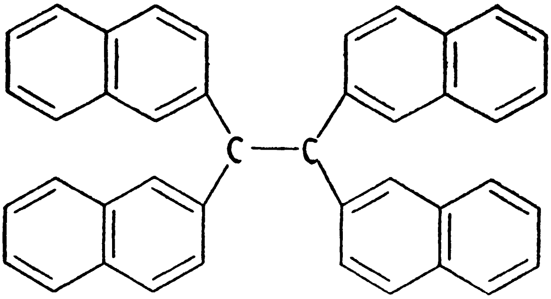
M. P., °C

285–286[20]

277[3, 4]

276–277[25]

1,1,2,2-Tetra-(2′-naphthyl)-ethane



M. P., °C
273.5[19]

---

x_4-Tetraphenyl-x,x-dihydronaphthacene (a)

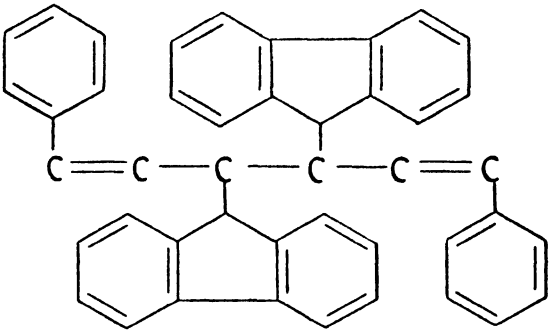
(Tetraphenyldihydrorubene)

M. P., °C
230–231[6]

(a) The structure of this compound was not clearly defined in the literature.

$C_{44}H_{34}$

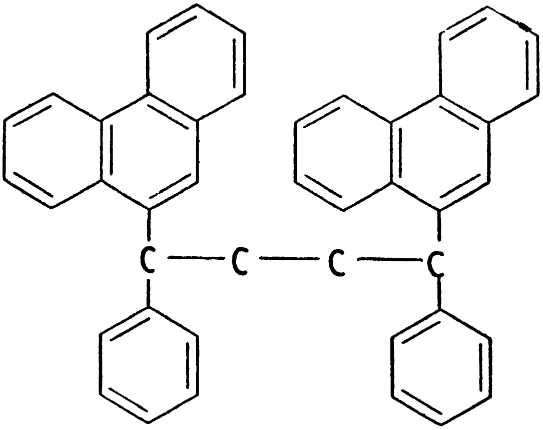
1,6-Diphenyl-3,4-di-(9′-fluoryl)-hexadiene-1,5



M. P., °C
204 (a)[18]
160–161 (a)[21]

(a) These constants were determined on isomeric forms.

1,4-Diphenyl-1,4-di-(9′-phenanthryl)-butane



M.P., °C
243.5[2]

References on Polynuclear Aromatics of Empirical Formula C_nH_{2n-54}

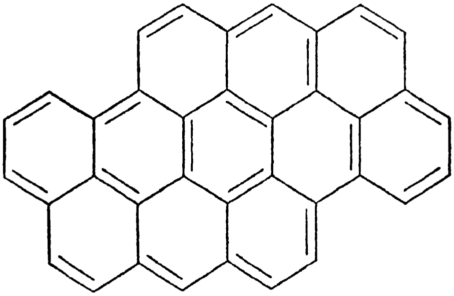
1. Bamberger, E., and F. D. Chattaway, Ann. **284,** 52 **1895.**
2. Bergmann, E., and F. Bergmann, J. Am. Chem. Soc. **59,** 1443 **1937.**
3. Chichibabin, A. E., and O. I. Magidson, J. prakt. Chem. [2] **90,** 168 **1914.**
4. Chichibabin, A., and O. Magidson, J. Russ. Phys. Chem. Soc. **46,** 1389 **1914;** Chem. Zentr. **1915,** I, 1123.
5. Dilthey, W., S. Henkels, and A. Schaefer, Ber. **71,** 974 **1938.**
6. Dufraisse, C., and R. Horclois, Bull. soc. chim. [5] **3,** 1880 **1936.**
7. Dufraisse, C., B. Masumoto, and R. Buret, Bull. soc. chim. [4] **51,** 74 **1932.**
8. Dufraisse, C., L. Velluz, and Mme. L. Velluz, Bull. soc. chim. [5] **5,** 600 **1938.**
9. Dziewoński, K., Ber. **36,** 962 **1903.**
10. Dziewoński, K., Bull. soc. chim. [3] **29,** 374 **1903.**
11. Dziewoński, K., Bull soc. chim. [3] **31,** 925 **1904.**
12. Dziewoński, K., and Z. Leyko, Ber. **47,** 1679 **1914.**
13. Dziewoński, K., and S. Suknarowski, Ber. **51,** 457 **1918.**
14. Goebel, M. T., and C. S. Marvel, J. Am. Chem. Soc. **55,** 3712 **1933.**
15. Halley, L. F., and C. S. Marvel, J. Am. Chem. Soc. **54,** 4450 **1932.**
16. Padoa, M., Atti accad. Lincei [5] **20,** I, 345 **1911.**
17. Padoa, M., Gazz. chim. ital. **44,** II, 517 **1914.**
18. Schlenk, W., and E. Bergmann, Ann. **463,** 1 **1928.**
19. Schmidlin, J., and M. Huber, Ber. **43,** 2824 **1910.**
20. Schmidlin, J., and P. Massini, Ber. **42,** 2377 **1909.**
21. Thiele, J, and F. Heule, Ann. **347,** 290 **1906.**
22. Vansheidt, A. A., J. Russ. Phys. Chem. Soc. **58,** 249 **1926;** C. A. **21,** 3616 **1927;** Chem. Zentr. **1927,** I, 92.
23. Vollmann, H., H. Becker, M. Corell, and H. Streeck, Ann. **531,** 1 **1937.**
24. Ward, J. J., W. R. Kirner, and H. C. Howard, J. Am. Chem. Soc. **67,** 246 **1945.**
25. Wuis, P. J., and D. Mulder, Rec. trav. chim. **57,** 1385 **1938.**

XXVI. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-56}

XXVI. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-56}

$C_{36}H_{16}$

Dinaphtho-[2,1,8-bcd,2′,1′,8′-klm]-coronene



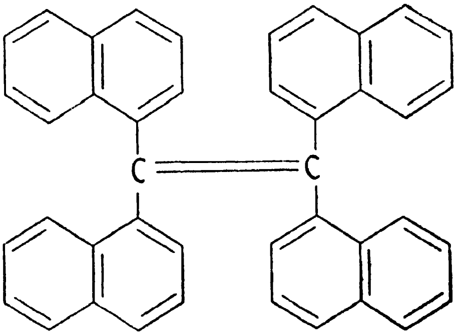
Additional Data

Sublimation Temp. (°C)

ca 500 1 mm[18]

$C_{42}H_{28}$

1,1,2,2-Tetra-(1′-naphthyl)-ethene

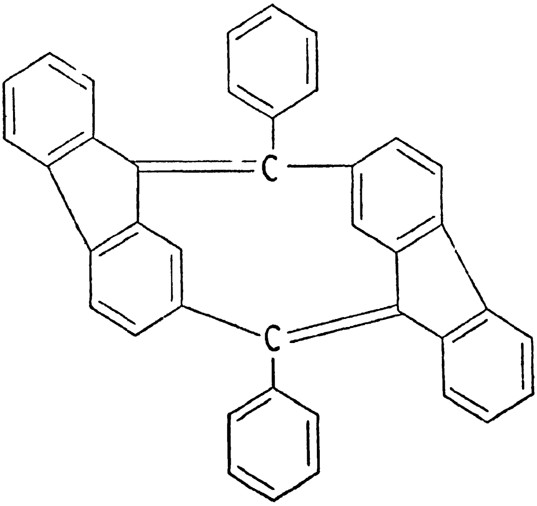


M. P., °C

322[3, 13]

$C_{40}H_{24}$

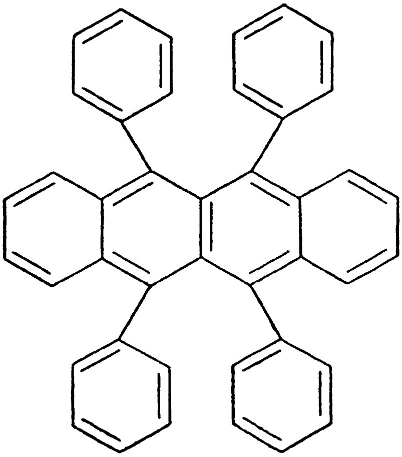
Difluoro-[2′,1′,9′-abc,2″,1″,9″-fgh]-5,10-diphenylcyclodec-adiene-4,9



M. P., °C

225[11]

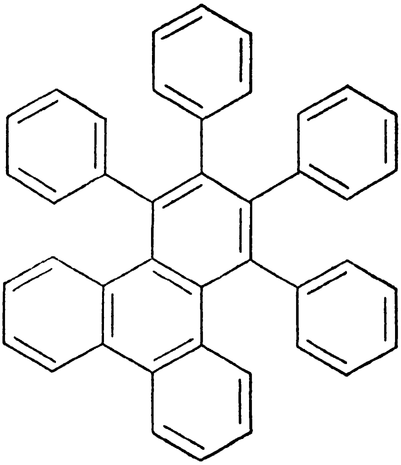
5,6,11,12-Tetraphenylnaphthacene
(Rubrene) (a)
(Tetraphenylrubene)



M. P., °C
333
335[1, 9]
334[7, 9]
332[20]
331[12, 14, 16]
330[2]

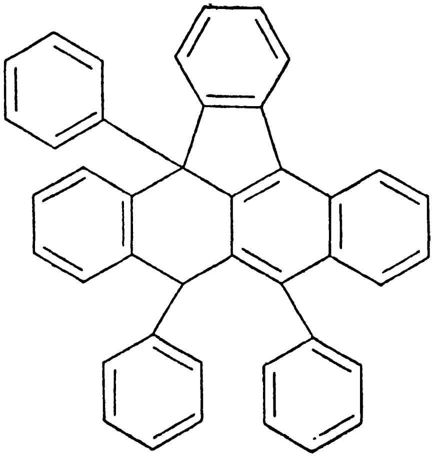
(a) This compound was thought by some investigators to be 2,2'-Bi-(1,3-diphenyl-4,5-benzocyclopentadien-3,5-ylidene). However, later work indicates that the above structure is correct.

1,2,3,4-Tetraphenyltriphenylene



M. P., °C
292–293[4]

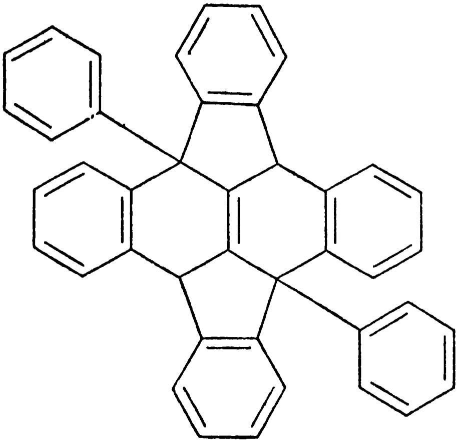
Indo-[1',2',3'-op]-5,6,11-triphenyl-6,11-dihydronaphthacene
(Pseudorubrene)



M. P., °C
278[1, 9]
210 (a)[16]

(a) This compound remelts at 278.

Diindano-[3′,2′,1′-fg,3″,2″,1″-op]-5,11-diphenyl-5,6,10,11-tetrahydronaphthacene

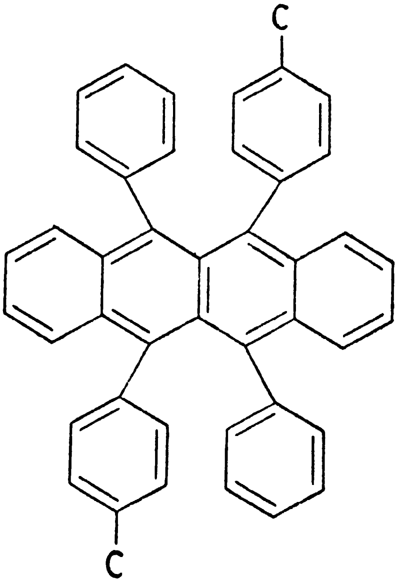


M. P., °C
338 (a)[1]
302 (a)[1]

(a) These constants were determined on stereoisomers.

$C_{42}H_{28}$

5,11-Diphenyl-6,12-di-*p*-tolylnaphthacene
(Bis-*p*-tolyl-diphenylrubene)
(Dimethylrubrene)

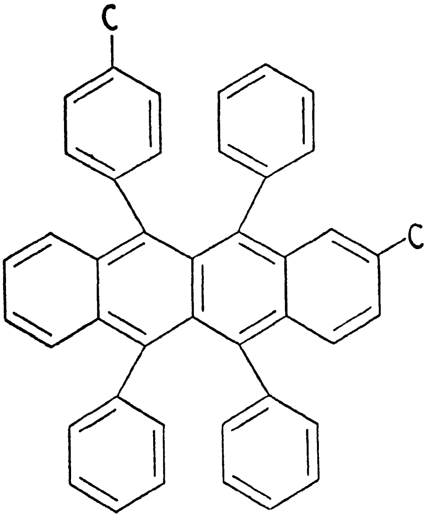


M. P., °C
205[5]

This series continued on next page

2-Methyl-5,6,12-triphenyl-11-*p*-tolylnaphthacene

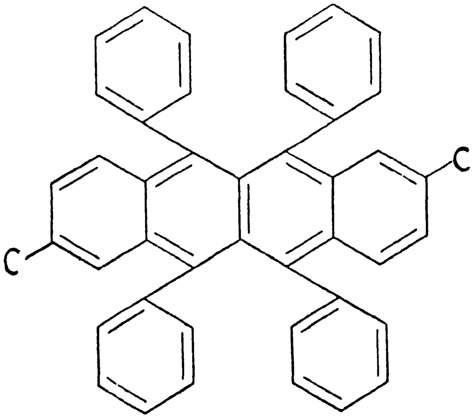
(Dimethylrubrene)



M. P., °C 273^5

2,8-Dimethyl-5,6,11,12-tetraphenylnaphthacene

(Dimethylrubrene)



M. P., °C

321^5

315 (a)^{17,19}

(a) The structure of this compound was not clearly defined in the literature.

Pseudobis-(*p*-tolyl)-diphenylnaphthacene (a)

M. P., °C

294-295 (b)^9

293-294 (b)^{10}

271-272 (b)^{9,10}

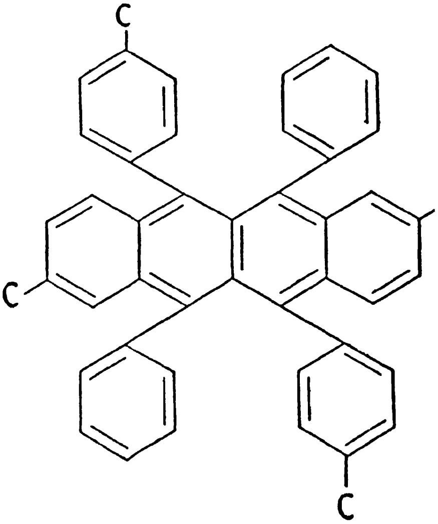
(a) The structure of this compound was not clearly defined in the literature.

(b) There constants were determined on isomeric forms.

$C_{46}H_{36}$

2,8-Dimethyl-5,11-di-*p*-tolyl-6,12-diphenylnaphthacene

(Dimethyldiphenylditolylrubene)



M. P., °C

242^6

$C_{48}H_{40}$

x_{12}-Dodecahydrofluorocyclene (a)

M. P., °C

326[8]

(a) The structure of this compound was not clearly defined in the literature.

References on Polynuclear Aromatics of Empirical Formula C_nH_{2n-56}

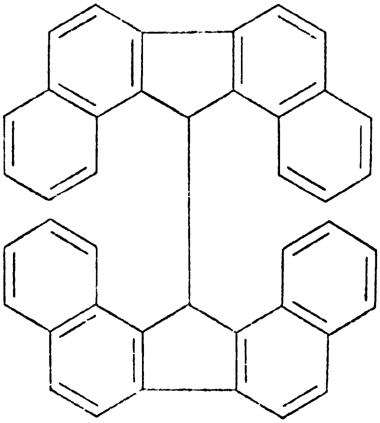
1. Badoche, M., Ann. chim. [10] **20,** 200 **1933.**
2. Bowen, E. J., and F. Steadman, J. Chem. Soc. **1934,** 1098
3. Chichibabin, A. E., and O. I. Magidson, J. prakt. Chem. [2] **90,** 168 **1914.**
4. Dilthey, W., S. Henkels, and A. Schaefer, Ber. **71,** 974 **1938.**
5. Dufraisse, C., and M. Lowry, Compt. rend. **194,** 1661 **1932.**
6. Dufraisse, C., and J. A. Monier, Compt. rend. **196,** 1327 **1933.**
7. Dufraisse, C., and L. Velluz, Bull. soc. chim. [5] **3,** 1905 **1936.**
8. Dziewoński, K., and L. Gizler, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1937A,** 441.
9. Enderlin, L., Ann. chim. [11] **10,** 5 **1938.**
10. Enderlin, L., Compt. rend. **193,** 1432 **1931.**
11. Ferrario, E., Chem. Ztg. **35,** 325 **1911.**
12. Hurd, C. D., and F. L. Cohen, J. Am. Chem. Soc. **53,** 1068 **1931.**
13. Magidson, O. I., Ber. **58,** 433 **1925.**
14. Moureu, C., and C. Dufraisse, Z. physik. Chem. **130,** 472 **1927.**
15. Moureu, C., C. Dufraisse, and G. Berchet, Compt. rend. **185,** 1085 **1927.**
16. Moureu, C., C. Dufraisse, and P. M. Dean, Compt. rend. **182,** 1440 **1926.**
17. Moureu, C., C. Dufraisse, and A. Willemart, Compt. rend. **187,** 266 **1928.**
18. Scholl, R., and K. Meyer, Ber. **67,** 1229 **1934.**
19. Willemart, A., Ann. chim. [10] **12,** 345 **1929.**
20. Wittig, G., and D. Waldi, J. prakt. Chem. [2] **160,** 242 **1942;** C. A. **37,** 5399 **1943.**

XXVII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-58}

XXVII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA C_nH_{2n-58}

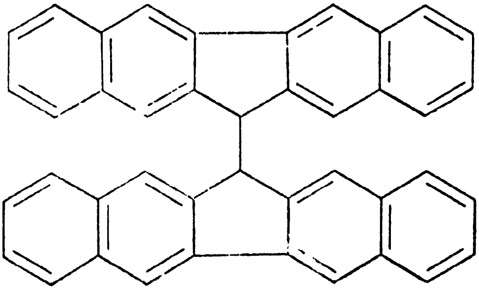
$C_{42}H_{26}$

9,9′-Bi-(1,2,7,8-dibenzofluoryl)



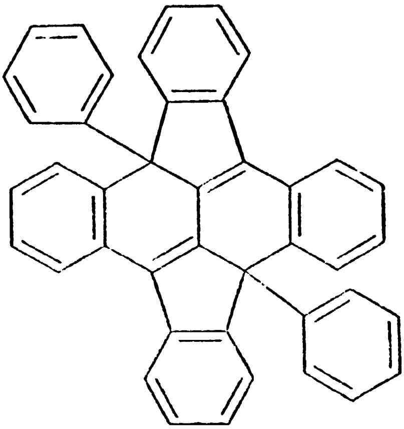
M. P., °C
353–355[7, 8]

9,9′-Bi-(2,3,6,7-dibenzofluoryl)



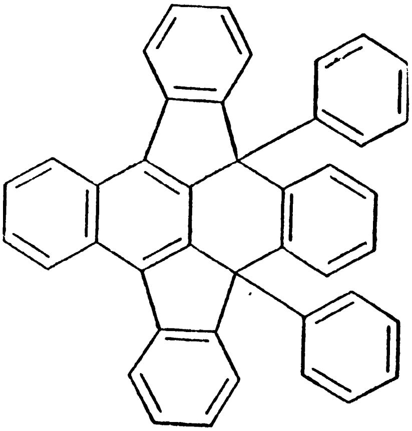
M. P., °C
310[3]

Diindo-[1′,2′,3′-fg,1″,2″,3″-op]-5,11-diphenyl-5,11-dihydronaphthacene
(Dehydrorubrene)



M. P., °C
455[2]

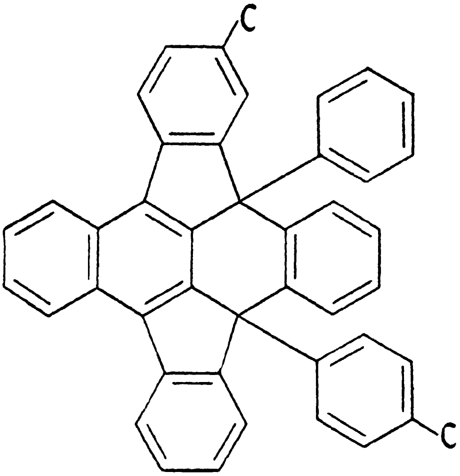
Diindo-[1′,2′,3′-fg,3″,2″,1″-op]-5,12-diphenyl-5,12-dihydronaphthacene
(Dehydrorubrene)



M. P., °C
430[5]
427–428[4]

$C_{44}H_{30}$

Indo-[1′,2′,3′-fg]-(6″-methylindo)-[3″,2″,1″-op]-5-*p*-tolyl-12-phenyl-5,12-dihydronaphthacene

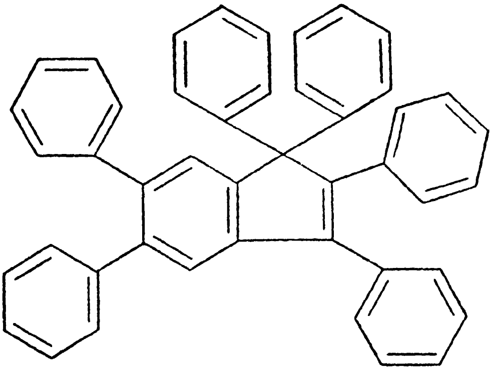


M. P., °C
340 (a)[5]

(a) This compound remelts at 370.

$C_{45}H_{32}$

1,1,2,3,5,6-Hexaphenylindene

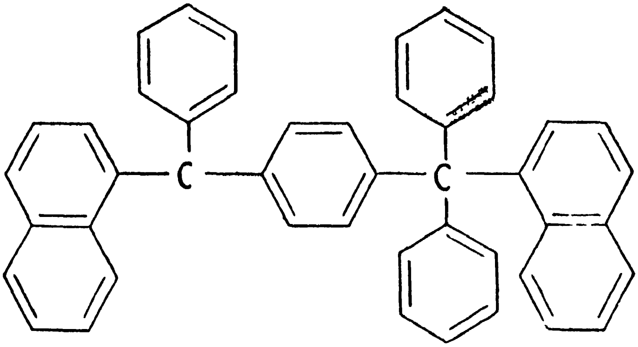


M. P., °C

This series continued on next page

$C_{46}H_{34}$

1-(1′-Naphthylphenylmethyl)-4-(1′-naphthyldiphenylmethyl)-benzene (a)



M. P., °C
234-235[6]

(a) The structure of this compound was not clearly defined in the literature.

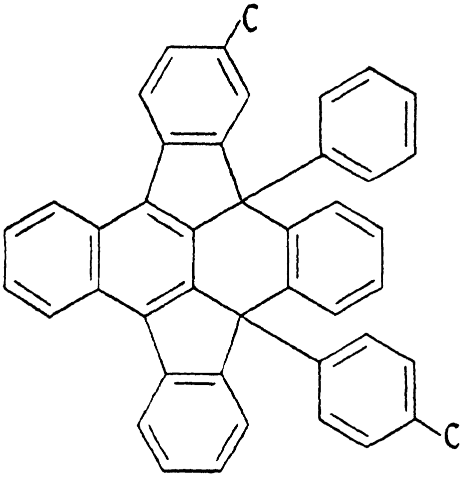
References on Polynuclear Aromatics of Empirical Formula C_nH_{2n-58}

1. Allen, C. F. H., and J. W. Gates, Jr., J. Am. Chem. Soc. **65**, 2129 **1943.**
2. Badoche, M., Ann. chim. [10] **20**, 200 **1933.**
3. Cook, J. W., and R. W. G. Preston, J. Chem. Soc. **1944**, 553.
4. Dufraisse, C., and L. Velluz, Bull. soc. chim. [5] **3**, 1905 **1936.**
5. Enderlin, L., Ann. chim. [11] **10**, 5 **1938.**
6. Gomberg, M., and C. S. Schoepfle, J. Am. Chem. Soc. **41**, 1655 **1919.**
7. Vanscheidt, A., Ber. **59**, 2092 **1926.**
8. Vanscheidt, A. A., J. Russ. Phys. Chem. Soc. **58**, 69 **1926**; C. A. **21**, 581 **1927**; Chem. Zentr. **1926**, II, 2428.

M. P., °C
430^5
427–428^4

$C_{44}H_{30}$

Indo-[1′,2′,3′-fg]-(6″-methylindo)-[3″,2″,1″-op]-5-*p*-tolyl-12-phenyl-5,12-dihydronaphthacene

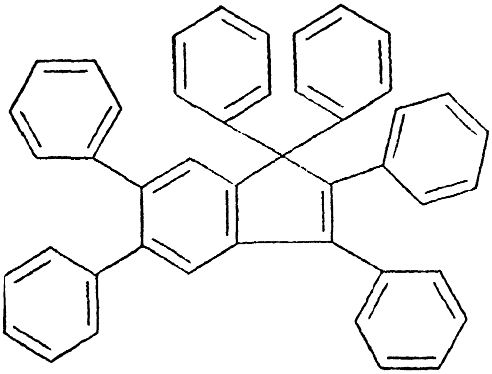


M. P., °C
340 (a)^5

(a) This compound remelts at 370.

$C_{45}H_{32}$

1,1,2,3,5,6-Hexaphenylindene

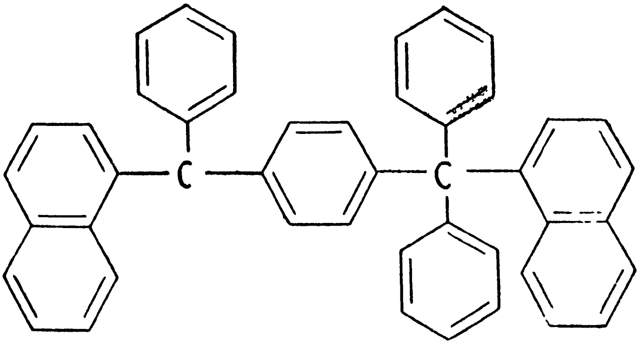


M. P., °C

This series continued on next page

$C_{46}H_{34}$

1-(1'-Naphthylphenylmethyl)-4-(1'-naphthyldiphenylmethyl)-benzene (a)



M. P., °C
234–235[6]

(a) The structure of this compound was not clearly defined in the literature.

References on Polynuclear Aromatics of Empirical Formula C_nH_{2n-58}

1. Allen, C. F. H., and J. W. Gates, Jr., J. Am. Chem. Soc. **65**, 2129 **1943**.
2. Badoche, M., Ann. chim. [10] **20**, 200 **1933**.
3. Cook, J. W., and R. W. G. Preston, J. Chem. Soc. **1944**, 553.
4. Dufraisse, C., and L. Velluz, Bull. soc. chim. [5] **3**, 1905 **1936**.
5. Enderlin, L., Ann. chim. [11] **10**, 5 **1938**.
6. Gomberg, M., and C. S. Schoepfle, J. Am. Chem. Soc. **41**, 1655 **1919**.
7. Vansheidt, A., Ber. **59**, 2092 **1926**.
8. Vansheidt, A. A., J. Russ. Phys. Chem. Soc. **58**, 69 **1926**; C. A. **21**, 581 **1927**; Chem. Zentr. **1926**, II, 2428.

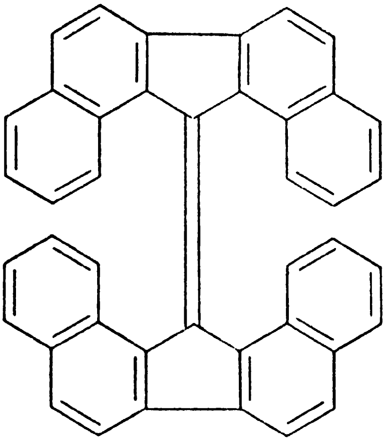
XXVIII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-60 \text{ to } 88}$

XXVIII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-60 \text{ to } 88}$

C_nH_{2n-60}

$C_{42}H_{24}$

9,9′-Bi-(1,2,7,8-dibenzofluorylidene) (a)



M. P., °C

357[24]

308–310[18, 19]

(a) The structure of this compound was not clearly defined in the literature.

$C_{48}H_{36}$

x_8-Octahydrofluorocyclene (a)

M. P., °C

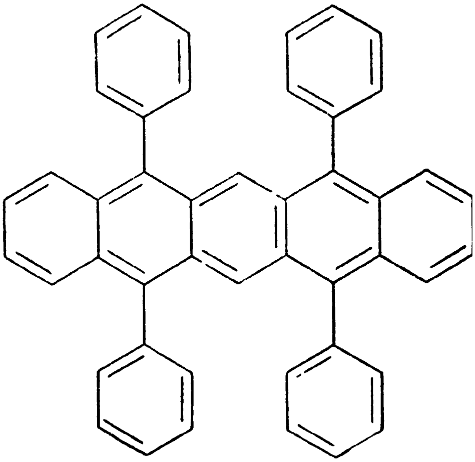
336–337[9]

(a) The structure of this compound was not clearly defined in the literature.

C_nH_{2n-62}

$C_{46}H_{30}$

5,7,12,14-Tetraphenylpentacene



M. P., °C

306–308[1]

C_nH_{2n-64}

$C_{48}H_{32}$

x_4-Tetrahydrofluorocyclene (a)

M. P., °C

348–349[9]

(a) The structure of this compound was not clearly defined in the literature.

$C_{49}H_{34}$

1,3-Diphenyl-9-(x′,x′,x′-triphenylphenyl)-fluorene (a)

M. P., °C

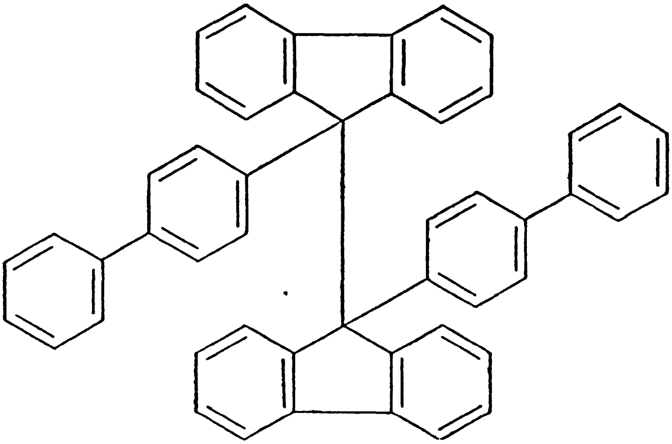
221[15]

(a) The structure of this compound was not clearly defined in the literature.

C_nH_{2n-66}

$C_{50}H_{34}$

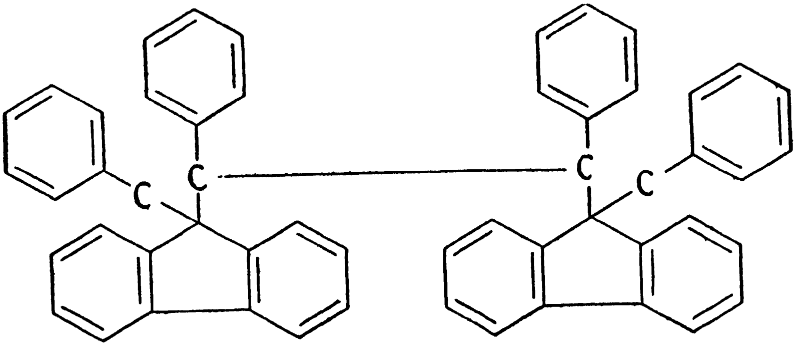
9,9′-Bi-(9-*p*-biphenylylfluoryl)



M. P., °C
175–176[23]

$C_{54}H_{42}$

1,2-Diphenyl-1,2-di-[9′-(9′-benzyl-fluoryl)]-ethane

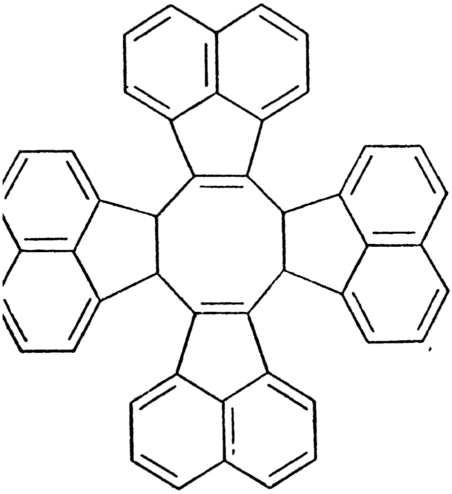


M. P., °C
304–306[22]

C_nH_{2n-68}

$C_{48}H_{28}$

1,2,3,4,5,6,7,8-Tetra-(2′,1′-acenaphtheno)-cyclooctadiene-1,5 (a)
(Fluorocyclene)

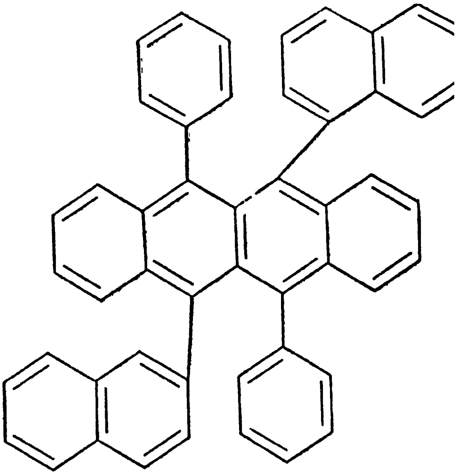


M. P., °C
396–397^{9,12}
395–396^{10}

(a) The double bonds may be in the 2- and 6-positions.

$C_{50}H_{32}$

5,11-Diphenyl-6,12-di-(2′-naphthyl)-naphthacene (a)



M. P., °C
280^{20,25}

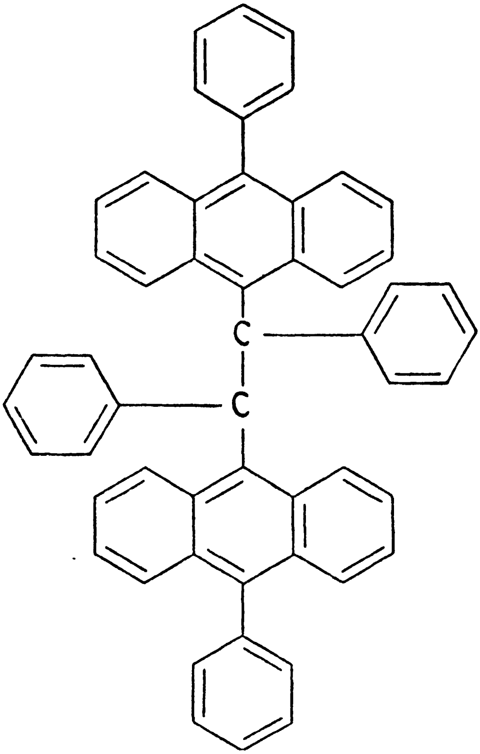
(a) This compound was named Dibenzorubrene in the literature.

This series continued on next page

C_nH_{2n-70}

$C_{54}H_{38}$

1,2-Diphenyl-1,2-di-[9′-(10′-phenylanthryl)]-ethane (a)

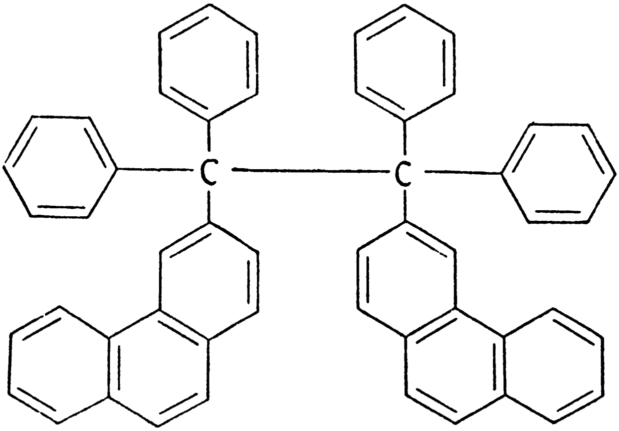


M. P., °C
252–253[14]

(a) The structure of this compound was not clearly defined in the literature.

This series continued on next page

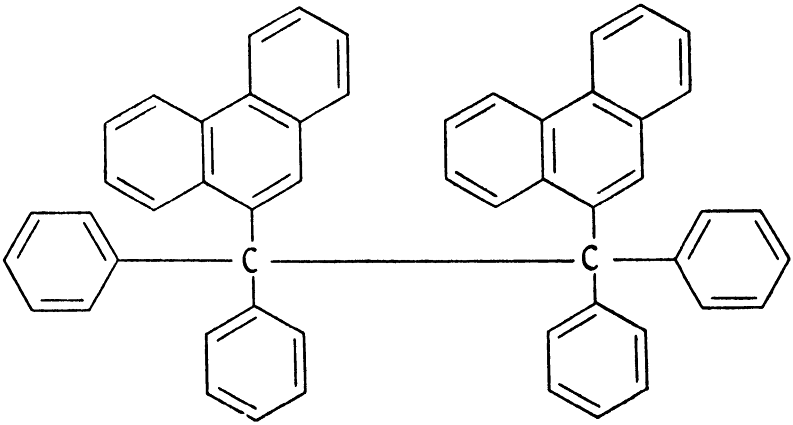
1,1,2,2-Tetraphenyl-1,2-di-(3′-phenanthryl)-ethane



M. P., °C
150–152 (a) (in nitrogen)[2]

(a) This compound melts with decomposition.

1,1,2,2-Tetraphenyl-1,2-di-(9′-phenanthryl)-ethane



M. P., °C
223–225 (in nitrogen)[21]
210–212[21]

$C_{55}H_{40}$

Di-[x-(x′-fluorylmethylfluoryl)]-methane (a)

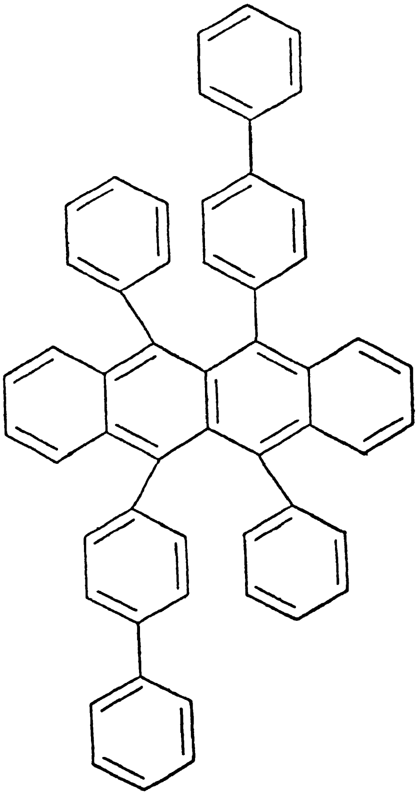
M. P., °C
$246\text{-}247^{11}$

(a) The structure of this compound was not clearly defined in the literature.

C_nH_{2n-72}

$C_{54}H_{36}$

5,11-Diphenyl-6,12-di-*p*-biphenylyl-naphthacene

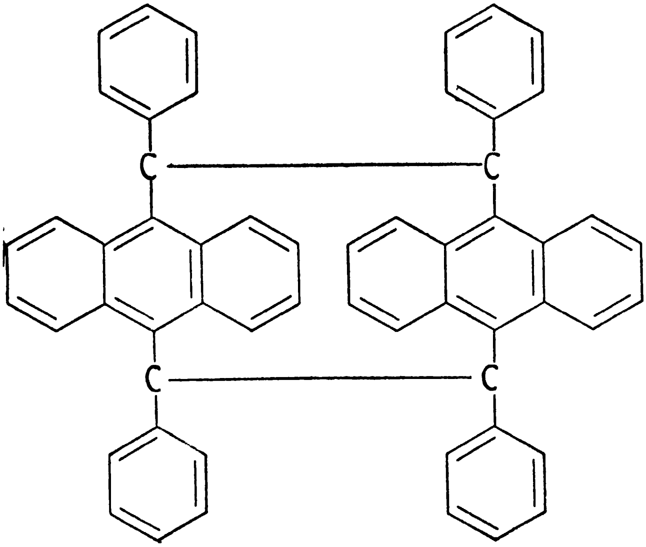


M. P., °C
317^{4}

This series continued on next page

$C_{56}H_{40}$

1,2,3,4-Tetraphenyl-1,2,3,4-diendo-(9′,10′-anthracene)-cyclobutane



M. P., °C
184[16, 17]

C_nH_{2n-74}

$C_{50}H_{38}$

x,x-Di-[x′-(phenanthryl)-phenylmethyl]-phenanthrene (a)

M. P., °C
195–197[13]

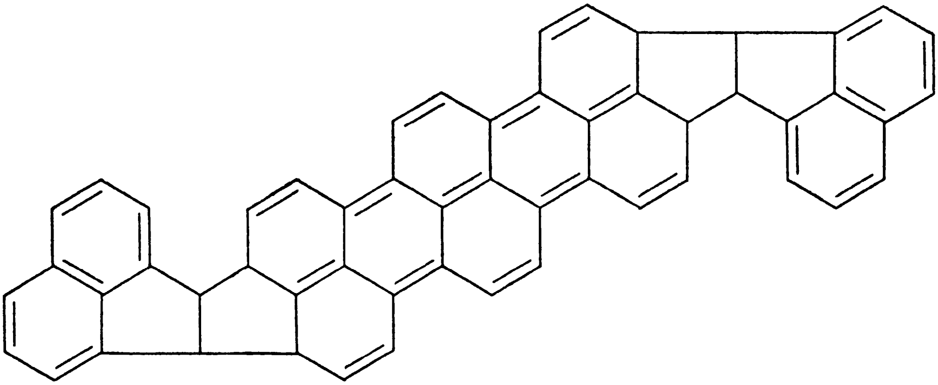
(a) The structure of this compound was not clearly defined in the literature.

This series continued on next page

C_nH_{2n-76}

$C_{54}H_{32}$

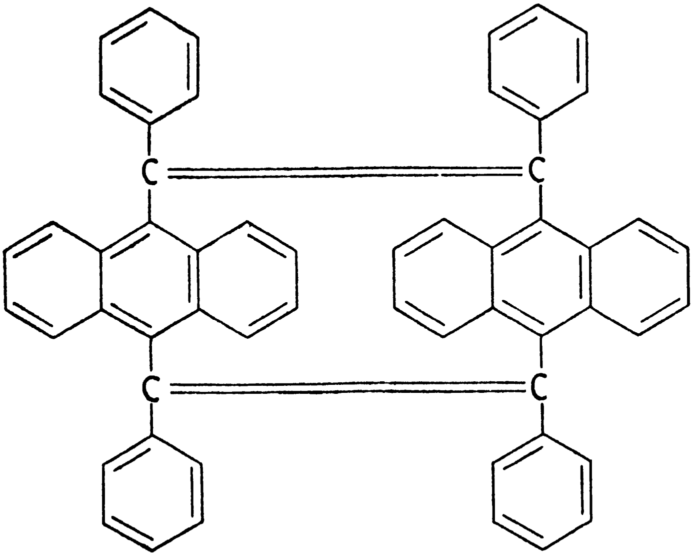
Leucacene



M. P., °C
250–252[5, 6]

$C_{56}H_{36}$

1,2,3,4-Tetraphenyl-1,4,2,3-diendo-(9′,10′-anthracene)-cyclobutadiene-1,3

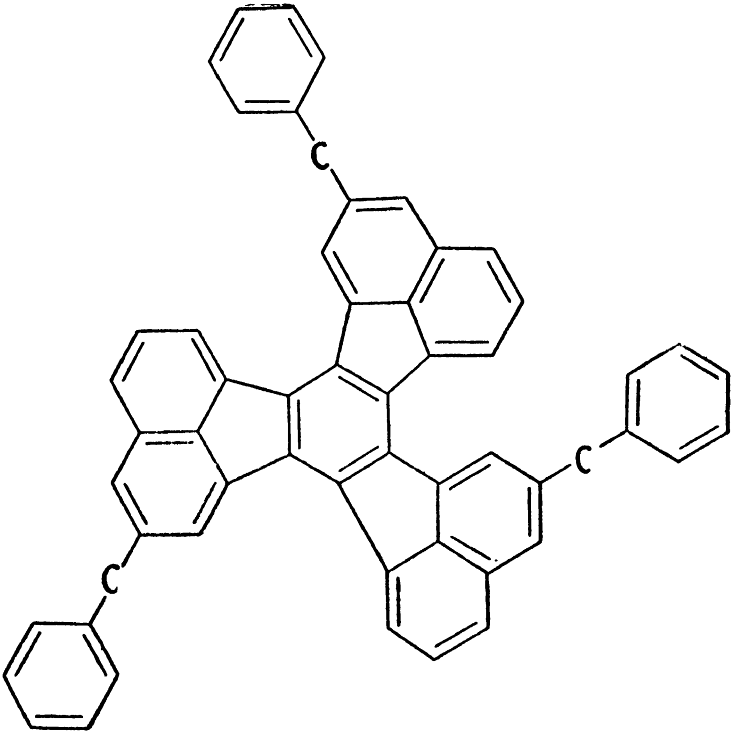


M. P., °C
197[16]

C_nH_{2n-78}

$C_{57}H_{36}$

1,2,3,4,5,6-Tri-[2′,1′-(4′-benzyl-acenaphtho)]-benzene



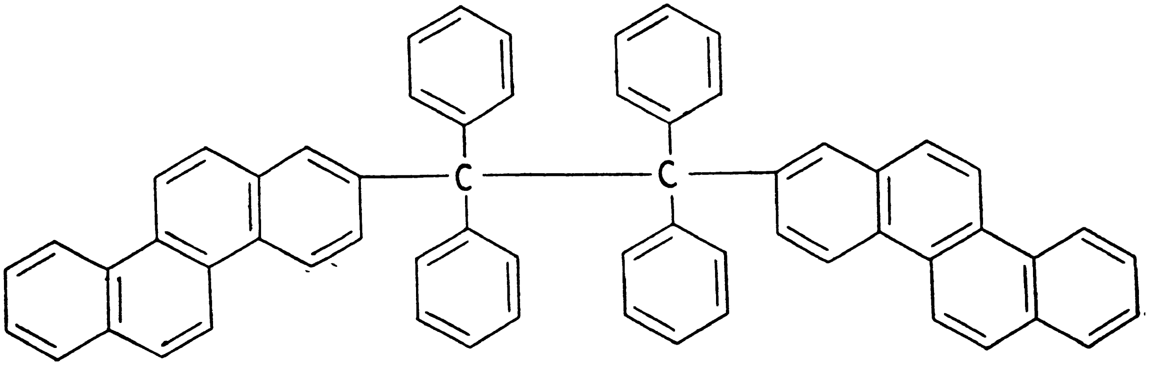
M. P., °C
270[8]
267–270[7]

This series continued on next page

C_nH_{2n-82}

$C_{62}H_{42}$

1,1,2,2-Tetraphenyl-1,2-di-(2′-chrysyl)-ethane



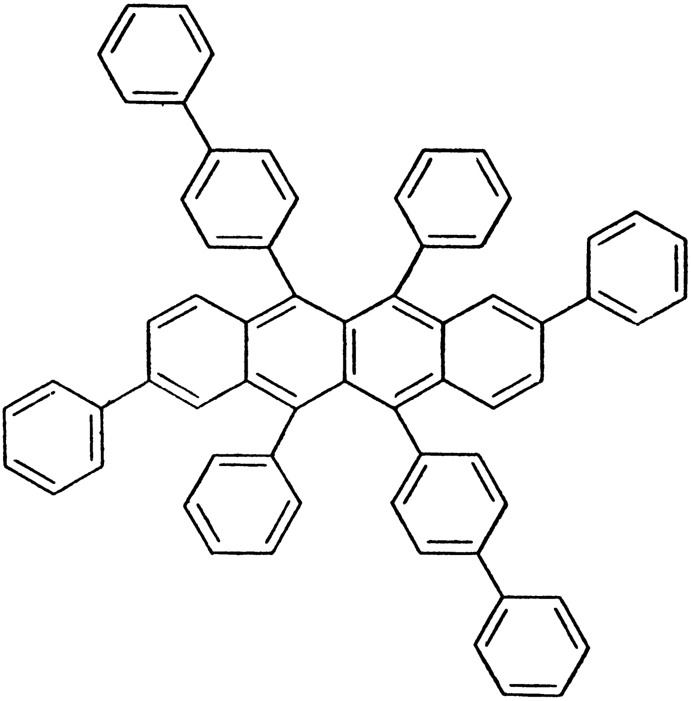
M. P., °C
239[21]

This series continued on next page

C_nH_{2n-88}

$C_{66}H_{44}$

2,6,8,12-Tetraphenyl-5,11-di-*p*-biphenylylnaphthacene



M. P., °C
320 (a)[3]

(a) This compound remelts at 380.

References on Polynuclear Aromatics of Empirical Formula $C_nH_{2n-60 \text{ to } 88}$

1. Allen, C. F. H., and A. Bell, J. Am. Chem. Soc. **64**, 1253 **1942**.
2. Bachmann, W. E., and M. C. Kloetzel, J. Org. Chem. **2**, 356 **1937-38**.
3. Duveen, D., and A. Willemart, Compt. rend. **207**, 1226 **1938**.
4. Duveen, D., and A. Willemart, Compt. rend. **208**, 1587 **1939**.
5. Dziewoński, K., Ber. **53**, 2173 **1920**.
6. Dziewoński, K., Bull. intern. acad. polon. sci., Classe sci. math. nat. **1919A**, 99.
7. Dziewoński, K., Bull. intern. acad. sci. Cracovie **1904A**, 201.
8. Dziewoński, K., Bull. soc. chim. [3] **31**, 925 **1904**.
9. Dziewoński, K., and L. Gizler, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1937A**, 441.
10. Dziewoński, K., and Ż. Leyko, Ber. **47**, 1679 **1914**.
11. Dziewoński, K., and M. Panek, Bull. intern. acad. polon. sci., Classe sci. math. nat. **1927A**, 745.
12. Dziewoński, K., and S. Suknarowski, Ber. **51**, 457 **1918**.

13. Frankforter, G., and W. Kritchevsky, J. Am. Chem. Soc. **37,** 385 **1915.**
14. Julian, P., and W. Cole, J. Am. Chem. Soc. **57,** 1607 **1935.**
15. Kohler, E. P., and L. W. Blanchard, J. Am. Chem. Soc. **57,** 367 **1935.**
16. Lippmann, E., and R. Fritsch, Ann. **351,** 52 **1907.**
17. Lippmann, E., and R. Fritsch, Sitzber. Akad. Wiss. Wien, Math. naturw. Klasse **113,** Abt. IIb, 429 **1904.**
18. Magidson, O. I., Ber. **58,** 433 **1925.**
19. Magidson, O., Trans. Sci. Chem. Pharm. Inst. (U. S. S. R.) **16,** 33 **1926;** C. A. **23,** 1633 **1929;** Chem. Zentr. **1928,** I, 58.
20. Moureu, C., C. Dufraisse, and A. Willemart, Compt. rend. **187,** 266 **1928.**
21. Müller, E., and W. Kruck, Ber. **71,** 1778 **1938.**
22. Schlenk, W., and E. Bergmann, Ann. **479,** 58 **1930.**
23. Schlenk, W., and A. Herzenstein, Ann. **372,** 21 **1910.**
24. Vansheidt, A. A., J. Russ. Phys. Chem. Soc. **58,** 249 **1926;** C. A. **21,** 3616 **1927;** Chem. Zentr. **1927,** I, 92.
25. Willemart, A., Ann. chim. [10] **12,** 345 **1929.**